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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : G06F 15/20, 15/22, 7/00, 17/60, 19/00, 17/30	A1	(11) International Publication Number: WO 00/02137 (43) International Publication Date: 13 January 2000 (13.01.00)
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(21) International Application Number: PCT/US99/15049

(22) International Filing Date: 2 July 1999 (02.07.99)

## (30) Priority Data:

60/091,476	2 July 1998 (02.07.98)	US
60/133,746	12 May 1999 (12.05.99)	US

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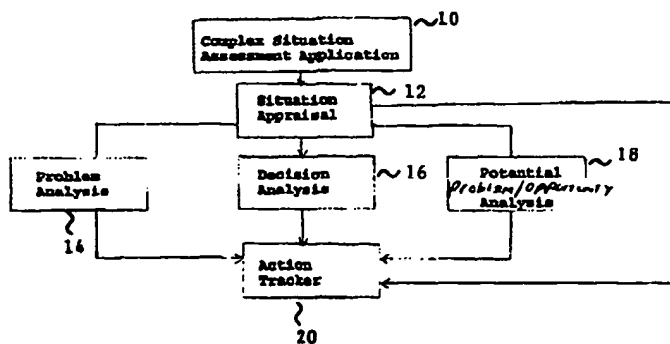
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(81) Designated States: AU, CA, JP, SG, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published

With international search report.

(54) Title: METHOD AND APPARATUS FOR PROBLEM SOLVING, DECISION MAKING, STORING, ANALYZING, RETRIEVING ENTERPRISEWIDE KNOWLEDGE AND CONCLUSIVE DATA



## (57) Abstract

A computer software application, graphical user interface, and method for entering information concerning a complex business situation (16), refining such information in a stepwise manner through the interface, generating a list of effective actions for addressing such a business situation, and storing such information in a knowledge base adapted for future query and reporting use of such a complex business situations (16), is provided. A set of screen sequences (14, 16, 18) allows entry of specific aspects of such a situation to generate an action list. A situation appraisal sequence allows entry of concerns stemming from the situation to prioritize such concerns. A problem analysis sequence (14) allows entry of causes of a problem, and refining the causes to determine a true cause. A decision analysis sequence (16) allows entry of alternatives concerning a decision, and refines such alternatives to determine one which suits the objective.

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**METHOD AND APPARATUS FOR PROBLEM SOLVING, DECISION  
MAKING, STORING, ANALYSING, RETRIEVING ENTERPRISEWIDE  
KNOWLEDGE AND CONCLUSIVE DATA**

5

**CROSS REFERENCE TO RELATED APPLICATIONS**

This application claims priority under 35 U.S.C.  
10 §119(e) to U.S. Provisional Patent Application No.  
60/091,476, filed July 2, 1998, entitled ELECTRONIC TOOL,  
and U.S. Provisional Patent Application No. 60/133,746,  
filed May 12, 1999, entitled ELECTRONIC TOOL, both  
incorporated herein by reference.

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**BACKGROUND OF THE INVENTION**

30 Modern business enterprises must address issues  
surrounding the business in a systematic, often time-  
driven, manner. Such business enterprises typically have  
an organizational structure, often of a hierarchical or  
matrix form, to define the various groups of individuals  
35 responsible for a particular area of the business. Often a  
particular issue evokes different concerns from different  
groups, resulting in differing definitions of a problem to  
be addressed. Further, individuals within the groups may  
not have the knowledge, or expertise, to effectively



address a particular problem or decision, due to factors such as inexperience or lack of longevity in a particular role.

Lines of communication can become blurred when individuals assume they share a common understanding of a problem. The notion of a problem surrounding a complex situation can have different meanings to different groups or individuals within the business enterprise. The term "problem" is often used indiscriminately to define factors such as a complex situation requiring action, a malfunction or error, the cause of a malfunction or error, a difficult choice, or future trouble. Each of these concerns requires different action, yet all elements may be common to a particular situation. Prior to implementing action, such a situation must be broken down into a manageable set of issues which require action, and which can be verified as the correct set of issues which will resolve the situation.

Effectively addressing the issues presented by such a complex situation, therefore, requires clarification of the exact issues to be acted upon. However, as indicated above, different groups and/or individuals have different needs, and each may have a different definition of the problem, depending on how the complex situation affects the responsibilities of that group and/or individual. Further, employment terminations, transfers, and organizational changes can result in a lack of individuals with expertise and experience concerning such a complex situation. Such factors can cause a business enterprise to implement ineffective actions, perform duplicative acts, or even to implement actions which exacerbate the situation.

It would be beneficial to provide a computer software program adapted to provide an interactive interface to receive information surrounding such a complex situation, display such information in a format which allows the user to refine issues in a stepwise manner, and store such information, including both the solution or resolution and

the thought processes that created them, for subsequent query and retrieval by multiple users for addressing future such complex situations.

5 BRIEF SUMMARY OF THE INVENTION

A computer software application, graphical user interface (GUI), and method for entering information concerning a complex business situation, refining such information in a stepwise manner through such an interface, 10 generating a list of effective actions for addressing such a business situation, and storing such information in a knowledge base adapted for future query and reporting use for such complex business situations, is provided. A set or sequence of process screen structures allows entry of 15 specific aspects of such a situation to generate such an action list. Such process screen sequences provide a systematic method to gather and organize information effectively in order to resolve a complex situation, and to store such information in a knowledge base for later query 20 and retrieval for the same or similar situations, thereby preserving enterprisewide knowledge and expertise. An action tracker interface is also provided which provides task management and monitoring of the various actions determined by the process screen sequences. The user has 25 the ability to access the process screens in a non-linear mode and can toggle between interview and worksheet modes described further below.

A situation appraisal process screen sequence provides a starting point in assessing a complex or ill-defined 30 business situation. An interface for entering concerns presented by such a situation is presented to a user, and allows prioritization and categorization of such concerns. In this manner a user determines which concerns should be addressed first, and whether these concerns present a 35 problem to be resolved, a decision to be made, or a potential problem which could result from a present plan or

decision. A list of actions to be undertaken by groups or individuals is defined through the action tracker interface to address the prioritized concerns, and includes an indication of which of the other process screen sequences should be undertaken: problem analysis, decision analysis, and/or potential problem/opportunity analysis.

A problem analysis process screen sequence provides an interface for entering information surrounding the problem in a selectively sequential, orderly manner, and for entering possible causes for the problem by drawing on the experience of the user and the knowledge base of past situations. Possible causes are then evaluated and eliminated in a prioritized manner to determine which possible cause explains the facts presented by the problem, and confirmed to be the true cause by verifying any questionable information pointing to the most probable cause. Actions and tasks needed to be undertaken to verify the most probable cause are assigned and monitored through the action tracker interface.

A decision analysis process screen sequence provides an interface to allow entry of a PURPOSE OF A DECISION based on specific lists of results sought, and entering alternatives which might satisfy each result. Alternatives are then considered with respect to each result. Various risks associated with each alternative are entered, and are ranked based on magnitude and probability. A decision choice is then determined by scrolling through and balancing the alternatives and risks. A decision analysis may be undertaken based on a situation appraisal, may be used to assess several possible causes resulting from a problem analysis, or may be undertaken independently. Actions needed to implement the decision are then entered and tracked using the action tracker interface.

A potential problem/opportunity analysis process screen sequence provides an interface to assess and determine actions to mitigate or eliminate future possible

problems and capitalize on opportunities which may arise during implementation of decisions and plans. This process screen sequence may be undertaken as indicated by a situation appraisal, may be used to evaluate a decision indicated by a decision analysis, or may be undertaken independently. Possible future problems or opportunities are identified and entered, and likely causes of each future problem are identified. Preventative actions which serve to reduce the likelihood of occurrence of each of the future problems are developed by scrolling through the likely causes, and contingent actions which may mitigate the result should the future problem occur despite the preventative action are also entered. Tasks required to implement the preventative actions and contingent actions are then entered and tracked using the action tracker interface.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The invention as defined herein will be more fully understood by reference to the following drawings and detailed description of the drawings, of which:

Fig. 1 shows a top level functional block diagram;

Fig. 2 shows a system architecture block diagram;

Fig. 3 shows a flowchart of the situation appraisal process screen sequence;

Fig. 4 shows a flowchart of the problem analysis process screen sequence;

Fig. 5 shows a flowchart of the decision analysis process screen sequence;

Fig. 6 shows a flowchart of the potential problem analysis process screen sequence;

Fig. 7 shows the LIST THREATS AND OPPORTUNITIES screen of the Situation Appraisal screen sequence;

Fig. 8 shows the SEPARATE AND CLARIFY CONCERNS screen of the Situation Appraisal screen sequence;

Fig. 9 shows the CONSIDER SERIOUSNESS, URGENCY AND GROWTH screen of the Situation Appraisal screen sequence;

Fig. 10 shows the DETERMINE ANALYSIS NEEDED screen of the Situation Appraisal screen sequence;

5 Fig. 11 shows the DETERMINE HELP NEEDED screen of the Situation Appraisal screen sequence;

Fig. 12 shows the STATE THE PROBLEM screen of the Problem Analysis screen sequence;

10 Fig. 13 shows the SPECIFY THE PROBLEM screen of the Problem Analysis screen sequence;

Fig. 14 shows the USE DISTINCTIONS AND CHANGES screen of the Problem Analysis screen sequence;

Fig. 15 shows the STATE POSSIBLE CAUSES screen of the Problem Analysis screen sequence;

15 Fig. 16 shows the TEST POSSIBLE CAUSES AGAINST SPECIFICATION screen of the Problem Analysis screen sequence;

Fig. 17 shows the DETERMINE THE MOST PROBABLE CAUSE screen of the Problem Analysis screen sequence;

20 Fig. 18 shows the GATHER FACTS TO VERIFY THE TRUE CAUSE screen of the Problem Analysis screen sequence;

Fig. 19 shows the THINK BEYOND THE FIX screen of the Problem Analysis screen sequence;

25 Fig. 20 shows the STATE THE DECISION screen of the Decision Analysis screen sequence;

Fig. 21 shows the DEVELOP OBJECTIVES screen of the Decision Analysis screen sequence;

Fig. 22 shows the CLASSIFY OBJECTIVES INTO MUSTS AND WANTS screen of the Decision Analysis screen sequence;

30 Fig. 23 shows the WEIGHT THE WANTS screen of the Decision Analysis screen sequence;

Fig. 24 shows the GENERATE ALTERNATIVES screen of the Decision Analysis screen sequence;

35 Fig. 25 shows the SCREEN ALTERNATIVES THROUGH THE MUSTS screen of the Decision Analysis screen sequence;

Fig. 26 shows the COMPARE ALTERNATIVES AGAINST THE WANTS screen of the Decision Analysis screen sequence;

Fig. 27 shows the IDENTIFY ADVERSE CONSEQUENCES screen of the Decision Analysis screen sequence;

5 Fig. 28 shows the MAKE THE BEST BALANCED CHOICE screen of the Decision Analysis screen sequence;

Fig. 29 shows the IMPLEMENT DECISION screen of the Decision Analysis screen sequence;

10 Fig. 30 shows the DEVELOP A PLAN screen of the Potential Problem Analysis screen sequence;

Fig. 31 shows the LIST POTENTIAL PROBLEMS screen of the Potential Problem Analysis screen sequence;

Fig. 32 shows the ASSESS THREATS screen of the Potential Problem Analysis screen sequence;

15 Fig. 33 shows the CONSIDER LIKELY CAUSES screen of the Potential Problem Analysis screen sequence;

Fig. 34 shows the TAKING PREVENTATIVE ACTION screen of the Potential Problem Analysis screen sequence;

20 Fig. 35 shows the TAKING CONTINGENT ACTION screen of the Potential Problem Analysis screen sequence;

Fig. 36 shows the MODIFY PLAN screen of the Potential Problem Analysis screen sequence;

Fig. 37 shows the ACTION TRACKER screen;

25 Fig. 38 shows the situation appraisal knowledge base ER diagram;

Fig. 39 shows the problem analysis knowledge base ER diagram;

Fig. 40 shows the decision analysis knowledge base ER diagram;

30 Fig. 41 shows the potential problem analysis knowledge base ER diagram;

Fig. 41a shows the potential opportunity analysis base ER diagram;

35 Fig. 42 shows the action tracker knowledge base ER diagram;

Fig. 43 shows the general process screen sequence class inheritance graph;

Figs. 44a-44c show the situation appraisal class inheritance graph;

5 Figs. 45a-45d show the problem analysis class inheritance graph;

Fig. 46 shows the decision analysis class inheritance graph;

10 Fig. 47 shows the potential problem analysis class inheritance graph;

Fig. 47a shows the potential opportunity analysis class inheritance graph;

Fig. 48 shows the action tracker class inheritance graph;

15 Fig. 49 shows the DEVELOP A PLAN screen of the Potential Opportunity Analysis screen sequence;

Fig. 50 shows the LIST POTENTIAL OPPORTUNITIES screen of the Potential Opportunity Analysis screen sequence;

20 Fig. 51 shows the ASSESS BENEFITS screen of the Potential Opportunity Analysis screen sequence;

Fig. 52 shows the CONSIDER LIKELY CAUSES screen of the Potential Opportunity Analysis screen sequence;

Fig. 53 shows the TAKING PROMOTING ACTION screen of the Potential Opportunity Analysis screen sequence;

25 Fig. 54 shows the TAKING CAPITALIZING ACTION screen of the Potential Opportunity Analysis screen sequence;

Fig. 55 shows the MODIFY PLAN screen of the Potential Opportunity Analysis screen sequence;

30 Fig. 56 shows a GUI screen indicative of the top-level menu as illustrated in Fig. 1;

Figs. 57-73 show an alternative embodiment of the GUI screens of the situation appraisal process screen sequence;

35 Figs. 74-84 show a first alternative embodiment of the GUI screens of the problem analysis process screen sequence; and

Figs. 85-137 show a second alternative embodiment of the GUI screens of the problem analysis process screen sequence.

5                    DETAILED DESCRIPTION OF THE INVENTION

          The top level functional block diagram of the complex situation assessment process screen sequences 10 as defined herein is shown in Fig. 1. Situation appraisal 12 is typically most applicable to an initial assessment and enumeration of concerns surrounding a situation. This appraisal results in an indication of which of the process screen sequences, problem analysis 14, decision analysis 16, or potential problem/opportunity analysis 18, is most applicable to a particular concern. Each of the three analysis process screen sequences 14, 16, 18 may also be invoked independently irrespective of a corresponding situation analysis. Action tracker interface 20 is available from all process screen sequences, and may also be invoked independently.

20            Fig. 2 shows an architectural block diagram of the system in which the situation assessment process screen sequences are invoked. Software architecture 23 as included, for example, in workstation 22 includes the process components 24 which comprise the situation appraisal, problem analysis, decision analysis, and potential problem/opportunity analysis software which drive the process screen sequences. Action tracker component 26 comprises software driving the action tracker, accessible from any of the process screen sequences. Knowledge base access and retrieval of prior situation assessment activities are performed by report writer component 28, for broad queries and retrieval of large quantities of data, and keyword query or other searching component 30, for pinpointing specific entities and situations. Other support and administrative functions are provided by



licensing management component 32, system support component 34, and administrative component 36.

Workstation 22 is networked to remote users 38, for enterprisewide access at remote locations, and local  
5 network server 40, for accessing the knowledge base 42 to store and retrieve prior situation assessment data. Archive database 44 and client database 46 are for backup functions and enterprise specific information, respectively.

10 The software as described above is executed on a device such as workstation 22. In this embodiment, workstation 22 is a 32 bit microprocessor-based system such as a PENTIUM® PC and executes on a WINDOWS® (94, 98, or NT) platform or other operating system as compiled. 16  
15 bit users may utilize commercially available extensions for use on older PCs. 32M main memory is recommended, however execution may be possible with less memory with lower performance.

The process screen sequences defined further below are  
20 point and click WINDOWS®-type graphical user interfaces common to many computer applications. Screens are scrolled through using common scroll arrow buttons, and pull-down menus may be used to jump between various screens in a particular screen sequence. A user may begin with any  
25 process screen sequence, also through a pull-down menu, although it is expected that a situation appraisal will precede one or more of the other process screen sequences. Each process screen sequence is identified by a unique process identifier or file name for later retrieval and  
30 knowledge base entry. Entry cells are either for free form entry of descriptive text, or pull-down menus to populate the field from among a list of finite choices. A user may elect either a worksheet mode or interview mode of operation. Worksheet mode is for the experienced user, and  
35 allows unprompted entry of data into the relevant fields to expedite the assessment. Interview mode is a more

structured environment which prompts the user with specific questions to elicit the proper type of data from the user. While slightly more time consuming, this mode allows a novice to produce an accurate assessment until the user is comfortable with worksheet mode. Modes may be toggled at any time. Information input by the user during interview mode is incorporated into the corresponding worksheet and vice-versa. Each of the process screen sequences outlined above are organized into deliverables called Process Application Kits (PAKs), which can be independently provided. Further, each PAK can be customized to suit a particular business focus or group of users through the COM object architecture (per MICROSOFT® Component Object Model). Additional PAKs can be developed to access the knowledge base accumulated with the process screen sequences, for example to generate project specific reports or to generate periodic reports about critical items. Throughout the process screen sequences, process checkers running in the background screen and filter data which is input by the user, thereby ensuring that complete and correct data is provided by the user throughout each screen sequence. These process checkers analyze the user input at various input points, and detect items which are likely to require refinement or correction. Constructively phrased messages are provided to the user to assist in proper correction of data entry, or to confirm that the input data is correct, along with corresponding prompts for response. In one embodiment, three process checkers are implemented, however additional checkers could be implemented to suit particular types of errors as the user base requires. Further, process checker messages may be toggled off by experienced users who do not require such assistance. An INFORMATION MISSTATED process checker employs rule-based analysis of input to detect skipped steps, unsound data, or incomplete analysis. Such messages are typically displayed as the

user attempts to advance to a next screen, after completing entry on the current screen, however could also be provided upon entry of a particularly suspect cell. A COMMON PITFALLS process checker flags areas where  
5 imprecise data will result in later difficulty, as with critical data items. Such messages are displayed prior to user input as a reminder, and do not analyze data after entry. A SHARPENER process checker assists in entry of critical fields where further prompting assists in  
10 refining the response. A series of questions is presented to the user to assist in editing the response entered in the cell. This process checker, therefore, guides the user through a series of successively narrower questions in order to pinpoint accurately the desired item of  
15 information. All process checkers may be overridden by the user once confirming that the response entered is in fact correct.

Cells as presented by the process screen sequences defined herein may be populated via direct text entry from  
20 the keyboard, or may be populated and/or supplemented by attaching an external file. These files are stored in the knowledge base and remain associated with the particular cell or record. Such files may be MICROSOFT® Word Documents, POWER POINT® files, jpegs, bitmaps, AUTOCAD®  
25 files, or other external file appropriate to the particular cell.

Flowcharts for exemplary situation appraisal, problem analysis, decision analysis, and potential problem analysis process screen sequences are shown in Figs. 3-6. Each of  
30 the steps in the flowcharts corresponds to a specific screen in the sequences described in further detail below. Specifically, Fig. 3 shows a situation appraisal flowchart 50; Fig. 4 shows a problem analysis flowchart 52; Fig. 5 shows a decision analysis flowchart 54, and Fig. 6 shows a  
35 potential problem analysis flowchart 56.

Software architecture is based upon various third-party toolkits and development platforms consistent with modern industry development standards to facilitate modifications and extensions. Unified Modeling Language (UML) is employed to standardize the object-oriented architecture. COM objects are provided where appropriate, to facilitate integration and modification. Rational Rose Modeler for software design, ERWin® for database modeling, and Delphi Client/Server are used to facilitate future enhancements.

#### SITUATION APPRAISAL

The situation appraisal screen sequence 50 provides a user interface which allows a situation to be subdivided into a set of specific concerns so that a user may graphically organize and clarify issues to be resolved. Each situation is stored in an individual situation file for later retrieval and database indexing. A situation background and theme are also provided to set the general business context and to be used as a reference or refresher for later querying and retrieval.

Once the situation file is created, the threats and opportunities screen, shown in Fig. 7, is then used to enter broad issues relating to general concerns of the situation. Users enter descriptive text for each broad issue in concern cells 100, which scroll downward to accommodate all the broad issues entered. Once complete, the ADVANCE SEQUENCE arrow button 102 is used to progress to the separate and clarify concerns screen shown in Fig. 8. Users then consider the broad issues entered in the previous screen, and clarify and refine them into distinct concerns in refined concern cells 104, removing redundant items and consolidating overlapping issues. When the modified list describes distinct refined concerns, rather than broad issues, ADVANCE SEQUENCE arrow 102 is used to progress to the concern consideration screen.

The concern consideration screen shown in Fig. 9 allows a user to enter specific information for each of the stored refined concerns 104 stemming from a particular situation, as listed on the separate and clarify concerns screen. This provides an interface to populate various cells addressing the seriousness 106, urgency 108, and growth 110, defined further below, of a particular situation, thereby allowing computation of a priority 112 for that concern. The CONCERN CONSIDERATION screen is used to refine details of each concern. Some of these cells are further subdivided into a specification, for descriptive text, and a relativity field, for ranking relative to other concerns.

The priority cell 112 is computed based on the relativity fields for seriousness, urgency, and growth, described further below, to provide an overall ranking of concerns. Alternatively, this cell may be overridden by the user through priority pull-down 112.

The SERIOUSNESS cell 106 is further divided into a specification cell 126 and a relativity cell 116. Users enter descriptive text in the specification cell 126 to describe the impact the concern in question will have with respect to human resources, safety, cost, customers, productivity, reputation, and other factor which affect the enterprise. The seriousness relativity cell 116 is for entering a discrete ranking of magnitude relative to the seriousness of other concerns. A ranking hierarchy such as high (H), medium (M), low (L), and need more data (NMD) can be entered here through a pull-down menu similar to the priority cell, and will be displayed as well as used in calculating priority.

The URGENCY cell 108 also has two components, a specification cell 128 and a relativity cell 118. The urgency specification cell 128 is for descriptive text directed to determining when resolution of this concern would become difficult, expensive, or impossible. The

urgency relativity cell 118 is for entering a discrete ranking of magnitude relative to the urgency of other concerns, similar to the priority cell pull-down.

5 The GROWTH cell also has specification and relativity components. Specification cell 130 is for descriptive text directed to determining the evidence that the seriousness of the concern will grow. The growth relativity cell 120 is for entering a discrete ranking relative to growth potential of other concerns, similar to the priority cell  
10 pull-down. High (H) indicates that the growth potential is increasing, medium (M) indicates that the growth potential is stable, and low (L) indicates that growth is decreasing. Need more data (NMD) may also be entered.

Once all concerns 104 relevant to the situation are  
15 entered, screen sequence button 102 is used to advance to the determine analysis needed screen in Fig. 10. For each concern entered, five clarifying cells are provided: PRIORITY, SERIOUSNESS, URGENCY, GROWTH, and PROCESS. Each concern cell entered on the previous screen is displayed,  
20 along with a PROCESS cell 140 for each concern. PROCESS cell also has specification 144 and a relativity components 142. Process relativity cell 142 is for entering the specific process sequences, described further below, that should be used to address each concern, and is selected by  
25 pull-down menu 146. A problem analysis sequence should be undertaken if the concern is directed to the cause of why a particular event or occurrence happened. A decision analysis sequence should be undertaken if the concern is directed to determining the course of action that should be  
30 pursued to address the concern. A potential problem analysis should be undertaken if the concern is directed to predicting future occurrences or events and possible remedial action to be taken. A further situation appraisal should be undertaken if the concern is too broad to be  
35 adequately addressed by the problem, decision, or potential problem analysis sequences.

After an analysis is selected for each concern, the DETERMINE HELP NEEDED screen (Fig. 11) is used to identify specific individuals or groups to execute the analysis determined in the previous screen and to identify the specific objective of the analysis. The DETERMINE HELP NEEDED screen has a PROCESS section 150, which echoes information from the DETERMINE ANALYSIS screen, and an ASSIGNMENT section 152, for specifying involvement of other people. The ASSIGNMENT section 152 is integrated with the action tracker, described further below, which provides scheduling for all screen sequences. ACTION cell 154 is used to enter descriptive text for the task and objective. This task is generally an "analysis" from the determine analysis screen, or other task for addressing a particular concern. WHO cell 156 is a pull-down menu of names for assignment to the analysis, and also allows for entry of new names. WHEN cell 158 indicates the completion date of the analysis. NOTES cell 160 is a descriptive text cell which can contain clarifying or specification information of the analysis, such as product, assembly line, or plant location. STATUS cell 162 is used to describe the current state of the task, and is a pull-down with the options not started, action assigned, cancelled, on hold, cause confirmed. Other status cell values may be entered. Sort pull-down 164 allows sorting by any of the ASSIGNMENT section cells. The result of this process screen sequence is that the user is provided with an indication of which of the analysis process screen sequences, problem, decision, or potential problem, are most applicable to the concern in question, as described further below.

#### PROBLEM ANALYSIS

The problem analysis screen sequence provides a user interface which allows a problem to be subdivided into a set of statements which describe various aspects of the problem and what they are and are not, creating a concise,

accurate problem specification. These statements are then assigned possible causes. The possible causes are then evaluated to determine the most probable cause and verify the most probable cause to determine if it is the true  
5 cause.

A problem background statement concerning the context is read from the situation appraisal file to which this problem analysis corresponds. This statement may be edited by the user or alternately, entered entirely by the user.  
10 This problem background statement is then stored in an individual problem analysis file for later retrieval and database indexing.

Referring to Fig. 12, the STATE THE PROBLEM screen is used to enter a statement of normal operation in the SHOULD  
15 BE HAPPENING cell 200 to describe what the object of the problem should be doing when performing properly. ACTUALLY HAPPENING cell 202 is then used to enter a perceived problem, which is the current condition of the object that is believed to be, or have, the problem. User then selects  
20 the applicable cause known/unknown button. If the cause is known, button 211 is selected, and the user is prompted that a problem analysis is not appropriate and an alternate screen sequence, such as decision analysis, may be applied. If the cause is not known, button 210 is selected, and the  
25 object of the problem is then entered in OBJECT cell 206, such as "motor", "assembly line five", or "Boston office". The DEVIATION cell 208 is used to enter the deviation from normal operation, such as "cracked housing" or "sales down ten percent".

30 The user then advances to the SPECIFY THE PROBLEM screen, for example as shown in Fig. 13, to enter specific statements of fact concerning the problem. A concise problem statement 212 from the object 206 and deviation 208 cells is carried over from the previous screen, and is the  
35 concatenation of the object and deviation cells to form a statement such as "Boston office sales down ten percent."



Eleven descriptor question cells 214 are provided (not all shown due to scroll down display), however fewer or additional statement cells could also be used. Collectively, these descriptor question cells are for

5 describing the problem in terms of four domains: what, where, when, and extent. The eleven descriptor question cells 214 are for entering information to address the following: problem object, problem deviation, geographical variance or location, location of the deviation on the

10 problem object, first problem (deviation) occurrence, most recent or subsequent problem (deviation) occurrence, problem cycle (during lifecycle history of object), number of problem objects (how many objects have/do not have the deviation), size of problem (magnitude of a single

15 deviation), number of problem deviations (how many deviations on each object), and problem trend (how it is/is not progressing). For each descriptor cell, two subfields are provided. In each subfield, for each of the eleven descriptors, the user enters descriptive text directed to

20 what the problem is 216 and is not 218. The IS descriptor subfield is for accurately refining and narrowing the object that has the deviation. The IS NOT descriptor subfield is for indicating which other closely related entities could have the deviation, but do not. By defining

25 both the IS and IS NOT subfields, the responses in these cells serve to establish clear boundaries around the problem. Additional descriptor question cells for a particular descriptor question may be added by clicking on insert button 220 if needed to accurately refine the

30 problem. For example, WHAT OBJECT descriptor 222 might further clarify specific product packaging that is and is not experiencing the deviation, and also might indicate which assembly lines are affected. Other comparative designators may be used in place of "is" and "is not".

35 Following entry of the IS/IS NOT descriptor cells, the user advances to one of two screens. The user may advance

to the USE DISTINCTIONS AND CHANGES screen shown in Fig. 14, which provides cells for entering distinctions between each of the IS/IS not descriptors entered previously. These distinction fields assist in entering possible causes  
5 (Fig. 15). Alternatively, if the user prefers using their own knowledge and experience, they may advance directly to the STATE POSSIBLE CAUSES screen.

The USE DISTINCTION AND CHANGES screen (Fig. 14) presents the user with the previously entered problem  
10 statement 212 and descriptor question cells 214, and provides, for each descriptor question, DISTINCTION 224 and CHANGE 226 cells. These DISTINCTION and CHANGE cells are for entering descriptive text to identify the distinctive features concerning the "IS" data 216 relative to the "IS  
15 NOT" data 218, for each of the descriptor questions 214. The information in these cells assists in identifying possible causes in the subsequent state possible causes screen (Fig. 15). Users enter distinctive features for each is/is not pair in DISTINCTION cells 224. Multiple  
20 distinctive features may be entered by clicking insert button 228 to insert a DISTINCTION cell. Not all descriptor IS/IS NOT cells need be populated, however a distinction may not be entered unless the corresponding descriptor question cells are populated. Descriptor IS/IS  
25 NOT cells may be entered here as well.

For each DISTINCTION cell 224, descriptive text concerning changes are entered in CHANGE cells 226. Such changes may be those that have occurred in, on, around, or about each distinction, in order to identify possible  
30 causes. Other changes may also be used. As with DISTINCTIONS 224, multiple change cells may be entered for each distinction by clicking the INSERT CHANGE button 230.

The user next advances to the STATE POSSIBLE CAUSES screen shown in Fig. 15. This screen has two formats  
35 depending on whether the user has elected to enter distinctions and changes. Fig. 15 shows the STATE POSSIBLE

CAUSES screen with the DISTINCTION and CHANGE cells 224, 226 echoed. If the user has not entered distinctions and changes, the descriptor question cells 214 and IS/IS NOT responses 216, 218 are displayed. For either screen  
5 descriptive text is entered in possible CAUSE cells based upon the information in the DISTINCTION/CHANGE cells 224, 226 or is/is not responses 216, 218, as applicable. The most effective possible causes tend to be provided by cross-correlating the eleven different descriptor questions  
10 to find common denominators and items which are mutually exclusive. Additional possible cause cells may be added through INSERT POSSIBLE CAUSE button 234.

Upon entry of POSSIBLE CAUSE cells 232, the user advances to the test possible causes against specification  
15 screen shown in Fig. 16. This screen presents possible causes one at a time in POSSIBLE CAUSE cell 236. The possible cause selection buttons 238 are used to scroll through the list of previously entered possible causes. The problem statement 212 is echoed here, as well as the  
20 descriptor questions 214 and responses 216, 218. A CONDITIONS 240 cell and an ASSUMPTIONS cell 242 are provided for user input. For each possible cause 236, users scan the list of descriptor questions 214. For each descriptor question, conditions 240 under which the  
25 possible cause would prove or disprove the descriptor question are entered. Conditions are entered under prefixes such as "ONLY IF", "YES BECAUSE", and "NO BECAUSE" via condition pull-down 244. Assumptions pertinent to the basic condition are then entered in ASSUMPTIONS/NOTES cell  
30 242. An "ONLY IF" assumption specifies the specific circumstances under which the possible cause would explain the particular descriptor question 214. A "YES BECAUSE" assumption explains why the possible cause would explain the particular descriptor question. A "NO BECAUSE"  
35 assumption explains why the possible cause could not explain the particular descriptor question 214, and

eliminates the possible cause 236 from the list. Conditions may be limited to three options to facilitate later sorting and processing of the possible causes to determine the true cause or causes, described below. Such  
5 an eliminated possible cause, however, and the associated assumption, is nonetheless retained in the knowledge base for subsequent queries, described further below with respect to the knowledge base query engine. Multiple ASSUMPTIONS/NOTES cells 242 needed to explain a particular  
10 descriptor question may be entered through INSERT ASSUMPTION button 246.

Following the entry of conditional assumptions, positive cause notes, and elimination of a subset of the causes, the DETERMINE MOST PROBABLE cause screen is called  
15 (Fig. 17). At this point the list of possible causes has been narrowed due to elimination of the possible causes resulting in a "NO BECAUSE" condition test, above. This screen presents remaining assumptions entered on the TEST POSSIBLE CAUSES screen (Fig. 16) in an ASSUMPTION cell 242,  
20 alongside the corresponding POSSIBLE CAUSE cell 236. For a listed possible cause, probability pull-down 247 may be used to assign a probability cell 248 from among: MPC (most probable cause, high (consider next), medium (also verify) and low (consider later). The ASSUMPTION cells 242 and  
25 POSSIBLE CAUSE cells 236 are sorted according to the probability 248 and the condition (244, Fig. 16) for use in the next screen.

The GATHER FACTS TO VERIFY THE TRUE CAUSE screen (Fig. 18) is then presented. Low probability possible causes are  
30 not carried over onto this screen, however such causes and assumptions are nonetheless stored in the knowledge base for later query use. The remaining possible causes and their respective assumptions are displayed in their respective cells 236, 246. Individual possible causes are  
35 considered by the user in a scrolling format which allows the user to advance through scroll buttons 248 from most

probable to the "ALSO VERIFY" possible causes. For each possible cause 236 presented, ACTION TRACKER cells 250 are used to enter actions needed to resolve the possible cause 236 and the accompanying assumptions 246. ACTION cell 252 is for descriptive text indicative of the specific test, activity, or question to be undertaken in order to confirm or deny a particular possible cause and the assumptions associated therewith. WHO cell 254 is for indicating the person or group responsible for the action, and WHEN cell 256 is for a completion date. NOTES cell 258 allows entry of descriptive text concerning other aspects of the action.

ACTION TRACKER cells 250 are integrated with the action tracker, described further below, which is integrated with the other process screen sequences as defined herein. In this manner, a concise itemization of the actions required to address a particular possible cause can be entered, stored in the knowledge base, and later searched and retrieved through the query engine, in addition to being codified for tracking the present problem. The query engine, described further below, may also be invoked to search for similar possible causes in the knowledge base. Resolution of the action items should then focus and refine the remaining possible causes to determine the true cause.

Fig. 19 shows the THINK BEYOND THE FIX SCREEN for entering data to enumerate ramifications of the actions just entered. This information may be useful in the potential problem analysis process screen sequence, described further below.

30

#### DECISION ANALYSIS

A situation appraisal, as described above, may also indicate that a decision analysis is warranted. A decision analysis, as described further below, allows a user to populate cells specifying objective aspects of the decision, and use these cells for reporting and querying of

35

the knowledge base to provide a graphical verification and record that all aspects concerning a particular decision were considered. The screens presented in the decision analysis screen sequence allow a user to populate cells  
5 focused on the objective of the decision, the alternatives which strive towards achieving that objective, risks associated with each alternative, and on selecting the final decision from among the alternatives.

Each decision analysis screen sequence is stored in a  
10 unique file to facilitate later indexing, searching and retrieval from the knowledge base. A previous or in process decision analysis can be selected for modification by the user, or a new decision analysis screen sequence may be entered.

15 Referring to Fig. 20, the STATE THE DECISION screen is shown. The DECISION BACKGROUND cell 300 is for descriptive text concerning the context and other data about the situation. Alternatively, this cell may be populated from a situation appraisal or action tracker sequence which  
20 raised this decision analysis. Next, a DECISION STATEMENT is entered in the decision statement cell 302. The decision statement should clarify the fundamental purpose of the decision, the intended result, and should set the scope of boundaries of the alternatives which will be  
25 considered. An overly broad decision statement may purport to provide a far reaching solution, but may also prove difficult to enumerate alternatives for, as will be described below, and may not provide informative value during future queries of the knowledge base.

30 Once the decision statement is entered, the user advances to the DEVELOP OBJECTIVE screen (Fig. 21). The DECISION STATEMENT cell 302 is echoed here, and additional cells for objectives 304 and notes 306 are provided. An INSERT OBJECTIVE button 308 allows entry of additional  
35 objectives. Using the DECISION STATEMENT 302 as a reference, the user enters descriptive text in the

OBJECTIVES cells 304 to indicate particular results to be achieved. Objectives, both short and long term and of varying priorities and constraints, are entered at this point to robustly populate the knowledge base. The  
5 criteria to measure the objective should be clear. Refinement occurs at a later screen. Notes concerning constraints, priority, or other aspects concerning this objective may be entered in NOTES cell 306.

After listing the objectives, the CLASSIFY OBJECTIVES  
10 screen, shown in Fig. 22, is displayed. This screen echoes the DECISION STATEMENT 302, and lists each OBJECTIVE and NOTES cell 304, 306 for review by the user. For each objective, a CLASSIFICATION cell 310 is provided. The user scans the objectives, and for each listed objective enters  
15 a classification of MUST or WANT, or other descriptive classification, in CLASSIFICATION cell 310 using pull-down menu 312. Objectives that are mandatory, measurable with a finite limit, and realistic should receive a classification value of MUST. Others that may be desirable should receive  
20 a classification value of WANT. Not all CLASSIFICATION cells need be entered; a default value of WANT is then assigned. Additional objectives may also be added at this screen by clicking INSERT OBJECTIVES button 308. In this manner the objectives sought by the decision are ranked  
25 into groups representing objectives such as uncompromisable and optional.

Next, the user advances to WEIGHT THE WANTS screen (Fig.23) to further classify the optional WANT objectives. Below the DECISION STATEMENT cell, each OBJECTIVE cell 304  
30 is displayed adjacent a WEIGHT cell 314. NOTES cell 306, corresponding to each objective, is also displayed, and may be further modified with descriptive text. Each OBJECTIVES cell 304 is further subdivided into a descriptive portion 316 and a relative weight portion 318. The relative weight  
35 portion may be implemented as a slide bar 320. For each WANT objective, the user determines a relative priority

weight. The most compelling objective is assigned a value of ten on a zero to ten scale, however the upper limit could be varied to suit the granularity desired as can the scale itself. The user then considers each remaining  
5 objective and assigns a relative weight accordingly.

Following the WEIGHT THE WANTS screen, the user progresses to the generate alternatives screen shown in Fig. 24. This screen is for generating alternatives based on the previously entered objectives. MUST and WANT  
10 objectives are displayed in MUST OBJECTIVES cell 322 and WANT OBJECTIVES cell 324. Want objectives may be sorted by relative weight cell 318 value, or may remain in the order entered. The user scrolls through the MUST and WANT objectives to generate alternatives, and enters these  
15 alternatives in ALTERNATIVE cell 326. The user may scroll through the objectives in any order. However, considering the MUST objectives first ensures that mandatory items are reflected in the resulting alternatives list. Additionally, users may query the knowledge base for  
20 previously entered alternatives using query engine, described further below. Additional alternatives may be entered by clicking INSERT ALTERNATIVES button 328. Objectives may also be added by clicking insert MUST OBJECTIVE button 330 and insert WANT OBJECTIVE button 332.  
25 Once all alternatives are entered, the user advances to the screen alternatives through the musts screen, shown in Fig. 25, to refine and narrow the entered alternatives.

On screen alternatives through the MUSTS screen (Fig. 25), the MUST OBJECTIVES 322 and the ALTERNATIVES 326 are  
30 displayed in a matrix form for review and selection. Scroll bars 336 and 334 can be used for horizontal scrolling through the alternatives and vertical scrolling through the must objectives, respectively. A FEASIBILITY cell 338 is therefore provided corresponding to each  
35 alternative and must objective. Descriptive text to describe how an alternative does or does not meet a must



objective is entered by the user in descriptive portion 340. Each FEASIBILITY cell 338 also has a GO/NO GO toggle button 342 to provide a discrete indication of whether an alternative satisfies a particular must objective. An  
5 alternative with even one "no go" attributed to it is deemed eliminated and is not carried forward. However, it will be retained in the knowledge base for later query and retrieval.

Following consideration of MUST objectives, the  
10 COMPARE ALTERNATIVES AGAINST THE WANTS screen (Fig. 26) is entered. This screen is provides a WANT ALTERNATIVE slider 344 to rank alternatives, such as on a 1-10 scale, rather than a discrete GO/NO GO toggle. Previously entered want weight 318 is also displayed for reference. For each want  
15 objective/alternative combination, a FEASIBILITY cell 340 is provided to describe the alternative with respect to the objective. Each WANT OBJECTIVE 304 is compared to ALTERNATIVES 326. The alternative which best satisfies the want objective receives a score 346 value of ten, or  
20 highest, using slider 344. The other alternatives for that WANT OBJECTIVE 324 are scored relative to the alternative which received the score of ten.

Once the ALTERNATIVES 326 are scored, a weighted score for each objective 324 is computed and displayed. The  
25 weighted score is the result of the weight value assigned the objective multiplied by the score value assigned to this alternative. The total weighted scores then indicate which alternatives best satisfy the objectives. Also provided is a total alternative score 348 for each  
30 alternative, which serves as an indicator of the alternatives having a greater overall impact. A tentative choice button 350 is clicked to indicate which alternatives are selected by the user, which need not be the alternatives having the highest total alternative score  
35 348.

Following the scoring of the alternatives, risks associated with each alternative selected for further evaluation are considered on the identify adverse consequences screen (Fig. 27). The remaining alternatives are displayed in descending order by total alternative score, one at a time in alternatives cell 326, along with the corresponding total alternative score cell 348. Users scroll through the alternatives carried over from the previous screen using alternative selection buttons 352.

As each alternative is displayed, users identify a possible adverse consequence 353 which could result from this alternative. The user enters descriptive text in "if" cell 354 to define the condition under which the adverse consequence could occur. Probability cell 356 is a pull-down of choices such as low, medium, and high, indicative of the probability that the adverse consequence will occur. "Then" cell 358 is for descriptive text concerning the result of the adverse consequence occurring, and seriousness cell 360 is a pull-down with the options low, medium, and high indicative of the magnitude of the result should the adverse consequence occur. Notes cell 362 is for descriptive text concerning other information about the condition or result for further clarification or later query. Multiple consequences for an alternative may be entered through INSERT adverse CONSEQUENCE button 364.

Fig. 28 shows the MAKE THE BEST BALANCED CHOICE screen. This screen is used to select one alternative as a decision by displaying cells for the ADVERSE CONSEQUENCES 353 carried over from the previous screen, the total alternative score cell 348, and the want OBJECTIVES cell 324, entered previously. Mandatory "MUST" objectives have already been considered by eliminating the alternatives which do not satisfy them. Accordingly, the adverse consequence cells 353, WANT OBJECTIVE cells 324, and ALTERNATIVES cells 326, may now be scrolled through to evaluate the elements of each available alternative 326.

Additional want objectives or adverse consequences may also be entered on this screen by clicking on INSERT WANT OBJECTIVE button 366 or INSERT ADVERSE CONSEQUENCE button 368, respectively. The chosen alternative is marked as a  
5 final decision by DECISION checkbox cell 370.

Following selection of final decision, the IMPLEMENT DECISION screen is displayed (Fig. 29). This screen displays the final decision 372 as chosen on the previous screen from the most appealing alternative 326, and further  
10 provides ACTION TRACKER cells for ACTION 376, WHO 378, WHEN 380, and NOTES 382. These cells provide input to the ACTION TRACKER, and are used similarly to the action tracker cells in the other screen sequences. Actions required to implement or complete the chosen decision are  
15 assigned to groups or individuals, scheduled, and tracked using the action tracker, described further below.

#### POTENTIAL PROBLEM ANALYSIS

Once a decision is made, the implementation of that  
20 decision may nonetheless encounter problems. The potential problem analysis screen sequence is used to enter and organize events and/or occurrences which may hinder the implementation of action plans. This screen sequence may be pursued following entry of ACTION TRACKER cells after a  
25 decision analysis or other process screen sequence, above, or may be undertaken alone with respect to an independent course of action.

Referring to Fig. 30, the DEVELOP A PLAN screen is shown. An action statement defining a specific and concise  
30 purpose of the action, task, or project is entered in ACTION STATEMENT cell 400. This statement may be carried over or modified from a decision analysis, or may be entered as free form text. A set of ACTION cells 402 is provided, which may be populated from an action tracker  
35 file or entered by the user. ACTION PLAN cell 404, NOTES cell 406, WHO cell 408, and WHEN cell 410 are used as in

other process screen sequences to enter actions or tasks, clarifying notes, responsible groups or individuals, and due dates, respectively, and are described with the action tracker description below. Additional ACTION cells may be entered by clicking on INSERT ACTION button 412.

List potential problems screen (Fig. 31) is then used to view each ACTION cell 403 individually, and enter potential problems which could be raised by the specific action in POTENTIAL PROBLEMS cell 416. The POTENTIAL PROBLEMS cell allows entry of a concise statement to respond to important areas of the corresponding action. This sequence therefore allows entry of specific, concise potential problems corresponding to a particular action for later analysis. Scroll buttons 414 are used to advance through the ACTION cells 402 to review each action.

After the user has entered the potential problems for the actions, the ASSESS THREATS screen (Fig. 32) is used to identify potential problems which require the most attention, and those which are unlikely to have a serious impact. The potential problems list entered on the previous screen therefore prioritizes the list to identify potential problems requiring attention first. ACTION STATEMENT cell 400 echoes the action statement. ACTION cell 403 lists the ACTION plan 404, NOTES 406, WHO 408, and when 410 cells individually, and may be scrolled using scroll buttons 414. For each ACTION cell 403, the potential problems associated with that action are listed in POTENTIAL PROBLEM cells 416. For a potential problem, the user enters a PROBABILITY cell 418, and a SERIOUSNESS cell 420. PRIORITY cell 422 is computed based on the values of the seriousness and probability cells after potential problems have been assigned values. PROBABILITY cell 418 is a pull-down with comparative values such as low, medium, and high. For each potential problem the user evaluates the probability of occurrence and enters a value accordingly. Similarly, SERIOUSNESS cell 420 is a low,

medium, high pull-down which is set according to the magnitude of the result should the potential problem occur. In this manner, the user can identify potential problems which represent an acceptable amount of risk, and those  
5 that need to be accounted for. INSERT PROBLEM button 424 can be used to add additional potential problems.

The CONSIDER LIKELY CAUSES screen (Fig. 33) is next used to enter likely causes of each of the potential problems. Each potential problem is displayed in POTENTIAL  
10 PROBLEM cell 426, along with the corresponding PRIORITY cell 422. In this manner, the user can elect to only address potential problems having a certain priority, high or medium, for example, and deem the others to represent an acceptable risk. For each potential problem chosen to be  
15 addressed, a LIKELY CAUSE cell 428 is provided for entering a concise statement of the actions, occurrences, or other events which might result in the potential problem. Multiple likely causes may be entered for each potential problem. A CAUSE PROBABILITY cell 430 is also provided to  
20 describe the probability of the cause occurring. CAUSE PROBABILITY pull-down 432 is used to enter a comparative discrete low, medium, or high value, while PROBABILITY notes portion 434 is used for descriptive text describing the probability. Additional likely causes attributed to a  
25 potential problem may be added through INSERT LIKELY CAUSE button 436.

The TAKING PREVENTIVE ACTION screen shown in Fig.34 is then used to enter one or more PREVENTIVE ACTION cells 438 corresponding to a particular likely cause. A preventative  
30 action to serve as a barrier against the likely cause is entered in this cell 438. CAUSE PROBABILITY cell 430 from the previous screen may be used to assess more serious likely causes first, or to accept the risk of a low probability likely cause.

35 Despite robust preventative actions, it is may be that the chance of a likely cause occurring cannot be reduced to

zero. TAKING CONTINGENT ACTION screen (Fig. 35) is used to enter actions which can minimize the effect if a particular potential problem nonetheless occurs. CONTINGENT ACTION cells 439 are used to enter such actions. Since such actions are only necessary if the potential problem occurs, TRIGGER cell 440 is used to specify the system, person, or event to invoke the particular contingent action. The information in TRIGGER cell 440 therefore contains information identifying the event that triggers and commences the contingent action to provide a rapid response to a particular potential problem. Additional CONTINGENT ACTION cells 439 and TRIGGER cells 440 may be added through the respective buttons 442, 444.

MODIFY PLAN screen (Fig. 36) is then used to review the action cells along with the preventative and contingent actions entered in this screen sequence. Upon finalization of the action plan, update ACTION TRACKER button 446 is used to store the information in the knowledge base where it is available to other process screen sequences as described further below with respect to the action tracker.

#### POTENTIAL OPPORTUNITY ANALYSIS

Once a decision is made, the implementation of that decision may provide additional opportunities. The potential opportunity analysis screen sequence is used to enter and organize events and/or occurrences which may offer opportunities in the implementation of action plans. This screen sequence may be pursued following entry of ACTION TRACKER cells following a decision analysis or other process screen sequence, above, or may be undertaken alone with respect to an independent course of action.

Referring to Fig. 49, the DEVELOP A PLAN screen is shown. An action statement defining a specific and concise purpose of the action, task, or project is entered in ACTION STATEMENT cell 900. This statement may be carried over or modified from a decision analysis, or may be

entered as free form text. A set of ACTION cells 902 is provided, which may be populated from an action tracker file or entered by the user. ACTION PLAN cell 904, NOTES cell 906, WHO cell 908, and WHEN cell 910 are used as in other process screen sequences to enter actions or tasks, clarifying notes, responsible groups or individuals, and due dates, respectively, and are described with the action tracker description below. Additional ACTION cells may be entered by clicking on INSERT ACTION button 912.

10 List potential opportunities screen (Fig. 50) is then used to view each ACTION cell 903 individually, and enter potential opportunities which could be raised by the specific action in POTENTIAL OPPORTUNITIES cell 916. The POTENTIAL OPPORTUNITIES cell allows entry of a concise  
15 statement to respond to important areas of the corresponding action. This sequence therefore allows entry of specific, concise potential opportunities corresponding to a particular action for later analysis. Scroll buttons 914 are used to advance through the ACTION cells 902 to  
20 review each action.

After the user has entered the potential opportunities for the actions, the ASSESS BENEFITS screen (Fig. 51) is used to identify potential opportunities which offer the greatest benefit, and those which are unlikely to have an  
25 opportunistic impact. The potential opportunities list entered on the previous screen therefore prioritizes the list to identify potential opportunities requiring attention first. ACTION STATEMENT cell 900 echoes the action statement. ACTION cell 903 lists the ACTION plan  
30 904, NOTES 906, WHO 908, and when 910 cells individually, and may be scrolled using scroll buttons 914. For each ACTION cell 903, the potential opportunities associated with that action are listed in POTENTIAL OPPORTUNITY cells 916. For each potential opportunity, the user enters a  
35 PROBABILITY cell 918, and a SERIOUSNESS cell 920. PRIORITY cell 922 is computed based on the values of the benefit and

probability cells after potential opportunities have been assigned values. PROBABILITY cell 918 is a pull-down with comparative values such as low, medium, and high. For each potential problem the user evaluates the probability of occurrence and enters a value accordingly. Similarly, BENEFIT cell 920 is a low, medium, high pull-down which is set according to the magnitude of the result should the potential opportunity occur. In this manner, the user can identify potential opportunities which represent an acceptable amount of benefit, and those that need to be acted upon. INSERT OPPORTUNITY button 924 can be used to add additional potential opportunities.

The CONSIDER LIKELY CAUSES screen (Fig. 52) is next used to enter likely causes of each of the potential opportunities. Each potential opportunity is displayed in POTENTIAL OPPORTUNITY cell 926, along with the corresponding PRIORITY cell 922. In this manner, the user can elect to only address potential opportunities having a certain priority, high or medium, for example, and deem the others to represent a lower priority benefit. For each potential opportunity chosen to be addressed, a LIKELY CAUSE cell 928 is provided for entering a concise statement of the actions, occurrences, or other events which might result in the potential opportunity. Multiple likely causes may be entered for each potential problem opportunity. A CAUSE PROBABILITY cell 930 is also provided to describe the probability of the cause occurring. CAUSE PROBABILITY pull-down 932 is used to enter a discrete comparative value such as low, medium, or high, while PROBABILITY notes portion 934 is used for descriptive text describing the probability. Additional likely causes attributed to a potential problem may be added through INSERT LIKELY CAUSE button 936.

The TAKING PROMOTING ACTION screen shown in Fig. 53 is then used to enter one or more PROMOTING ACTION cells 938 corresponding to a particular likely cause. A promoting



action to serve as a barrier against the likely cause is entered in this cell 938. CAUSE PROBABILITY cell 930 from the previous screen may be used to assess higher benefit likely causes first, or to no longer consider a low probability likely cause.

Despite robust promoting actions, it is unlikely that the chance of a likely cause occurring can be increased to be a certainty. TAKING CAPITALIZING ACTION screen (Fig. 54) is used to enter actions which can maximize the effect if a particular potential opportunity occurs, whether caused by the promoting action or not. CAPITALIZING ACTION cells 939 are used to enter such actions. Since such actions are only necessary if the potential opportunity occurs, TRIGGER cell 940 is used to specify the system, person, or event to invoke the particular capitalizing action. The information in TRIGGER cell 940 therefore provides an enumeration to provide a rapid response to a particular potential opportunity. Additional CAPITALIZING ACTION cells 939 and TRIGGER cells 940 may be added through the respective buttons 942, 944.

When the capitalizing actions and triggers have been identified, it is often necessary to take preparatory actions that set the capitalizing actions and/or triggers in place before the potential opportunity might occur, and to remove the capitalizing actions and triggers after the potential opportunity could no longer occur.

MODIFY PLAN screen (Fig. 55) is then used to review the action cells along with the promoting and capitalizing actions entered in this screen sequence. Upon finalization of the action plan, update ACTION TRACKER button 946 is used to store the information in the knowledge base where it is available to other process screen sequences as described further below with respect to the action tracker.

## ACTION TRACKER

The action tracker interface is used to store, identify and compare tasks, responsible individuals or groups, due dates, and other logistical information associated with the various process screen sequence defined herein. The action tracker can be updated directly, or through action tracker data entered during the process screen sequences. Referring to Fig. 37, the ACTION TRACKER master screen is shown. This screen is similar to the ACTION TRACKER entry screen in the other process screen sequences. ACTION FILE cell 500 is used to select a previously entered action file for review and/or update. Action files on users systems across the network are listed here for various action files resulting from the process screen sequences described above. In this manner, enterprisewide monitoring of the various process screen sequences being undertaken is provided. REFRESH button 503 can be used to update the action tracker master screen with any new information entered by a user concerning a process screen sequence.

CONCERN cells 502 in the ACTION FILE 504, that can also be implemented in the other processes, list the concerns stored in the ACTION FILE 504 selected. Each concern is evaluated by criteria such as: urgency, growth, and seriousness, and is specified along a scale through a pull-down menu. A fourth cell, PRIORITY, is computed based on the values of the other three. SERIOUSNESS cell 506 is for entering a discrete ranking of magnitude relative to the seriousness of other concerns, and has a value of High (H), medium (M), low (L), and need more data (NMD). URGENCY cell 508 is rated based on a determination of when resolution of this concern would become difficult, expensive, or impossible, and has a value of low, medium, or high. GROWTH cell 510 is for indicating the potential that the seriousness of the concern will grow. PROCESS cell 512 is for specifying which of the process screen

sequences applies to this concern: situation appraisal, problem analysis, decision analysis, or potential problem analysis. CONCERN SORT pull-down 514 allows the CONCERNS 502 from the action file to be sorted by various fields  
5 such as concern, process, or priority. VIEW BY pull-down 527 allows a user to view all concerns in the action file, or only those specific to a certain individual, such as all concerns to which the user is attributed an action.

Clicking on a CONCERN cell 502 displays all actions  
10 currently entered for that concern in the ACTION cells 516, for review and/or modification. Additional actions may be added to those uploaded from the action file. WHO cell 518 specifies the group or individuals responsible for executing the task specified in the action cell, and may be  
15 modified through a pull-down list of names and groups. Multiple names may be entered, and new names not in the pull-down may be added. WHEN cell 520 indicates the expected completion date of the action. STATUS cell 524 provides a discrete indication of milestones reached  
20 concerning the action, such as not started, in progress, late, action assigned, cancelled, on hold, cause confirmed. Additional status milestones may be added. NOTES cell 522 contains descriptive text concerning other information. ACTION SORT pull-down 526 allows the listed actions to be  
25 sorted by various fields such as ACTION, WHO, WHEN, NOTES, or STATUS. Actions may automatically be mailed electronically to others, including to recipients who are not users of the system. Alternative screen formats for the various GUI screens disclosed herein are listed in  
30 Figs. 56-137.

#### KNOWLEDGE BASE STRUCTURE

An entity-relationship (ER) diagram of the knowledge base accumulated through the various process screen  
35 sequences as defined herein is shown in Figs. 38-42. In addition, the knowledge base links process applications and

tracks changes made on a user-by-user basis.

Situation appraisal ER diagram is shown in Fig. 38, and contains cells for storing the information entered in the cells during the situation appraisal process screen sequence. CONCERN 600, PRIORITY 602, and the PROCESS 604 to be used for further analysis are stored in refined CONCERN entity 606. ACTION TRACKER cells WHO 608, ACTION 610, and WHEN 612 are stored in INVOLVEMENT entity 614.

Fig. 39 shows the problem analysis ER diagram, and contains cells pertinent to the problem analysis process screen sequence. SHOULD BE HAPPENING 616, ACTUALLY HAPPENING 618, OBJECT 620, and DEVIATION 622 are stored in PROBLEM entity 624. IS/IS not cells are stored in RESPONSE entity 626. DISTINCTIONS 628 are stored in DISTINCTIONS entity 630. CHANGES 632 are stored in CHANGES entity 634. POSSIBLE CAUSES 636 are stored in PROBABLE CAUSES entity 638. CONDITIONS AND ASSUMPTIONS 640 are stored in TEST RESPONSES entity 642. CONFIRMED TRUE CAUSE 644 is stored in BEYOND FIX 646. ACTION TRACKER cells are stored in CAUSE ACTIONS entity 648.

Fig. 40 shows the decision analysis ER diagram. BACKGROUND 650 and STATEMENT 652 are stored in DECISION ENTITY 654. SCORES 656 for the various alternatives are stored in ALTERN 658.

Potential problem analysis ER diagram is shown in Fig. 41. POTENTIAL PROBLEM 660, SERIOUSNESS 664, and PROBABILITY 662 are stored in SPECIFICATION entity 666. LIKELY CAUSES 668 are stored in CAUSE entity 670. PREVENTATIVE ACTIONS 672 are stored in PREVENT ACTION entity 674. CONTINGENT ACTIONS 676 are stored in CONTINGENCY ACTION 678 entity, and corresponding TRIGGERS 680 are stored in TRIGGER entity 682.

Potential opportunity analysis ER diagram is shown in Fig. 41a, and is similar in structure to the potential problem analysis ER diagram shown in Fig. 41. Potential opportunity 660a, benefit 664a, and probability 662a are

stored in SPECIFICATION entity 666a. Likely causes 668a are stored in CAUSE entity 670a. PROMOTING ACTIONS 672a are stored in PROMOTE ACTION entity 674a. Capitalizing actions 676a are stored in CAPITALIZING ACTION 678a entity, and corresponding triggers 680a are stored in TRIGGER entity 682a.

Fig. 42 shows the action tracker ER diagram. CONCERNS 684, SERIOUSNESS 686, URGENCY, 688, GROWTH 690, and PRIORITY 692 are stored in CONCERNS entity 694. ACTIONS 696, WHO 698, WHEN 700, NOTES 704, and STATUS 702 are stored in ITEMS entity 706.

The knowledge base as described above is populated with cells entered in the corresponding process screen sequences. This knowledge base may be queried during current process screen sequences to draw upon knowledge obtained from prior process screen sequences. Such queries and reports are through a standard SQL interface, and may be broad report-based statistical information, or specific keyword queries to pinpoint a specific process screen sequence. Such keyword queries are facilitated by the use of a master keyword table. Prior to saving any of the process screen sequences as defined herein, process records are parsed for occurrences of new keywords. New keywords not previously entered are displayed to the user, who is prompted to enter, categorize, and create associations for the keywords in the master keyword table.

These queries and reports may be predetermined, to address periodic status items such as displaying all unresolved problem analysis, or to list all decisions concerning a particular product line, or may be individual point-and-click queries using the individual knowledge base fields. An integrated database engine such as ORACLE® provides initial support for the knowledge base, however other database engines using SQL or other query language could be employed in alternative implementations or to customize an application to a particular user.

## CLASS HIERARCHY

The class inheritance graphs of the complex situation assessment application as defined herein are shown in Figs. 43-48. Where applicable, connection links (A)-(N) are shown with the respective circled capital letters to indicate multiple sheet graphs.

The general process screen sequence class inheritance graph 800 is shown in Fig. 43. This graph defines the general process class common to the process screen sequences defined above. Situation appraisal inheritance graph is shown on Figs. 44a-44c. Situation class 802 is derived from the general process class, and manipulates situation background and general information. Concerns are manipulated by initial CONCERNS class 804 and REFINED CONCERNS class 806. Analysis needed is manipulated by SPECIFICATION class 808.

Referring to Figs. 45a-45d, the problem analysis inheritance graph is shown. PROBLEM ANALYSIS analysis class 810 is derived from the general PROCESS class 800 (Fig. 43). INITIATING DATA class 812 manipulates the problem object and the problem deviation. Test against SPECIFICATION class 814 manipulates is/is not information. POSSIBLE CAUSE class 816 manipulates possible causes. Changes and distinctions are handled by DISTINCTION/CHANGES pairs class 818.

Decision analysis process screen sequence class inheritance graph is shown in Fig. 46. DECISION ANALYSIS class 824 is derived from the general process class (800, Fig. 43). Objectives are manipulated by DECISION ANALYSIS OBJECTIVES class 818. Alternatives are handled by DECISION ANALYSIS ALTERNATIVES class 820. Adverse consequences are manipulated by DECISION ALTERNATIVES RISK class 822.

Fig. 47 shows the class inheritance graph for the potential problem analysis screen sequence. POTENTIAL PROBLEM ANALYSIS class 826 is derived from the general

PROCESS class 800, and also handles the action statement. Action description, probability, and seriousness are handled by POTENTIAL PROBLEM ANALYSIS SPECIFICATION class 828. Likely causes and preventative actions are handled by  
5 the LIKELY CAUSES AND PREVENTATIVE ACTION classes 830 and 832, respectively. Contingent actions and the associated triggers are handled by CONTINGENCY ACTION and ACTION TRIGGER classes 834 and 836, respectively.

Fig. 47a shows the class inheritance graph for the  
10 potential opportunity analysis screen sequence. POTENTIAL OPPORTUNITY ANALYSIS class 826a is derived from the general PROCESS class 800a, and also handles the action statement. Action description, probability, and benefit are handled by POTENTIAL OPPORTUNITY ANALYSIS SPECIFICATION class 828a.  
15 Likely causes and promoting actions are handled by the LIKELY CAUSES AND PROMOTING ACTION classes 830a and 832a, respectively. Capitalizing actions and the associated triggers are handled by CAPITALIZING ACTION and ACTION TRIGGER classes 834a and 836a, respectively.

20 Action tracker inheritance graph is shown on Fig. 48. ACTION TRACKER CONCERNS class 838 manipulates concerns and the related ranking cells of seriousness, urgency, growth, and priority as defined above. Action descriptions and associated logistic scheduling data is manipulated by  
25 ACTION TRACKER ITEMS class 840.

As various extensions and modifications to the present invention, including alternate embodiments of screen layout, sequence, and input methods may be apparent to those skilled in the art, the present invention is not  
30 intended to be limited except by the following claims.

## CLAIMS

1. A method of gathering, processing, storing, and displaying information concerning a complex business situation comprising the steps of:
- 5 providing a graphical user interface for entering data concerning said complex business situation;
- refining said data in a predetermined, stepwise manner through user interaction with said graphical user interface;
- 10 generating, through said stepwise manner and said graphical user interface, a list of effective actions for addressing said complex business situation; and
- storing said data in an indexed and normalized form
- 15 in a knowledge base adapted for structured query and retrieval in performing said steps of refining and generating.
2. A computer program product comprising computer readable program code fixed on a computer readable medium operable to receive, process, store, and display information concerning a complex business situation comprising:
- 20 computer readable program code for providing a graphical user interface for entering data concerning said complex business situation;
- computer readable program code for refining said data in a predetermined, stepwise manner through user interaction with said graphical user interface;
- 30 computer readable program code for generating a list of effective actions for addressing said complex business situation through use of said computer readable program code for refining said data; and
- computer readable program code for storing said data
- 35 in an indexed and normalized form in a knowledge base adapted for structured query and retrieval by said



computer readable program code for refining said data and said computer readable program code for generating said list.

- 5     3.   An apparatus for gathering, processing, storing, and displaying information concerning a complex business situation comprising:

          a graphical display device operable to provide a graphical user interface for entering data concerning said  
10   complex business situation;

          a digital input device for entering said data;

          a first memory for storing said data for indexed retrieval;

          a processor for refining said data stored in said  
15   first memory in a predetermined, stepwise manner through user interaction with said graphical user interface and said digital input device;

          a second memory having a set of instructions operable by said processor to generate, through said stepwise  
20   manner and said graphical user interface, a list of effective actions for addressing said complex business situation; and

          a third memory operable to store said entered data and said refined data in an indexed and normalized form in  
25   a knowledge base adapted for structured query and retrieval.

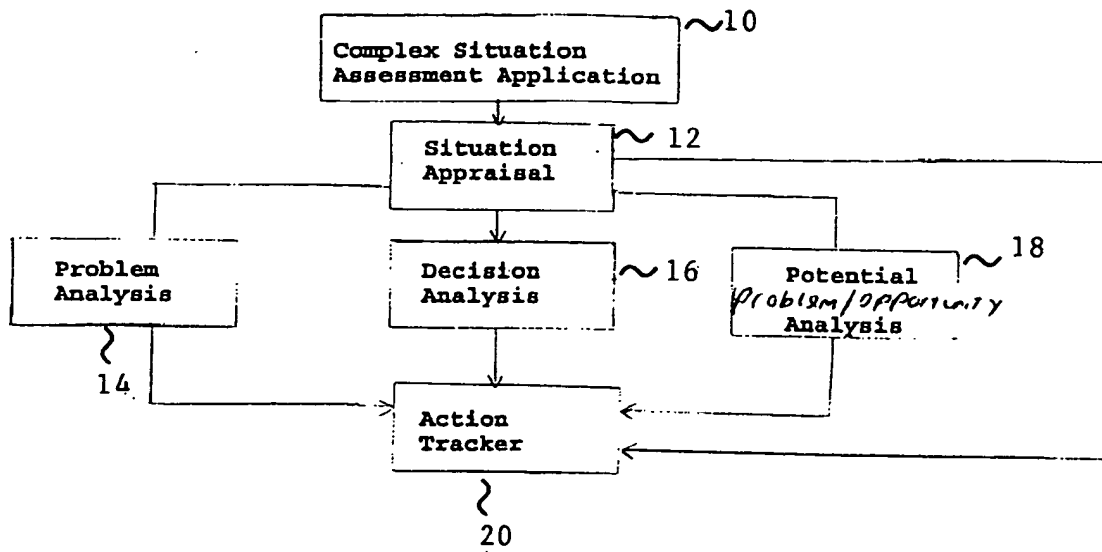
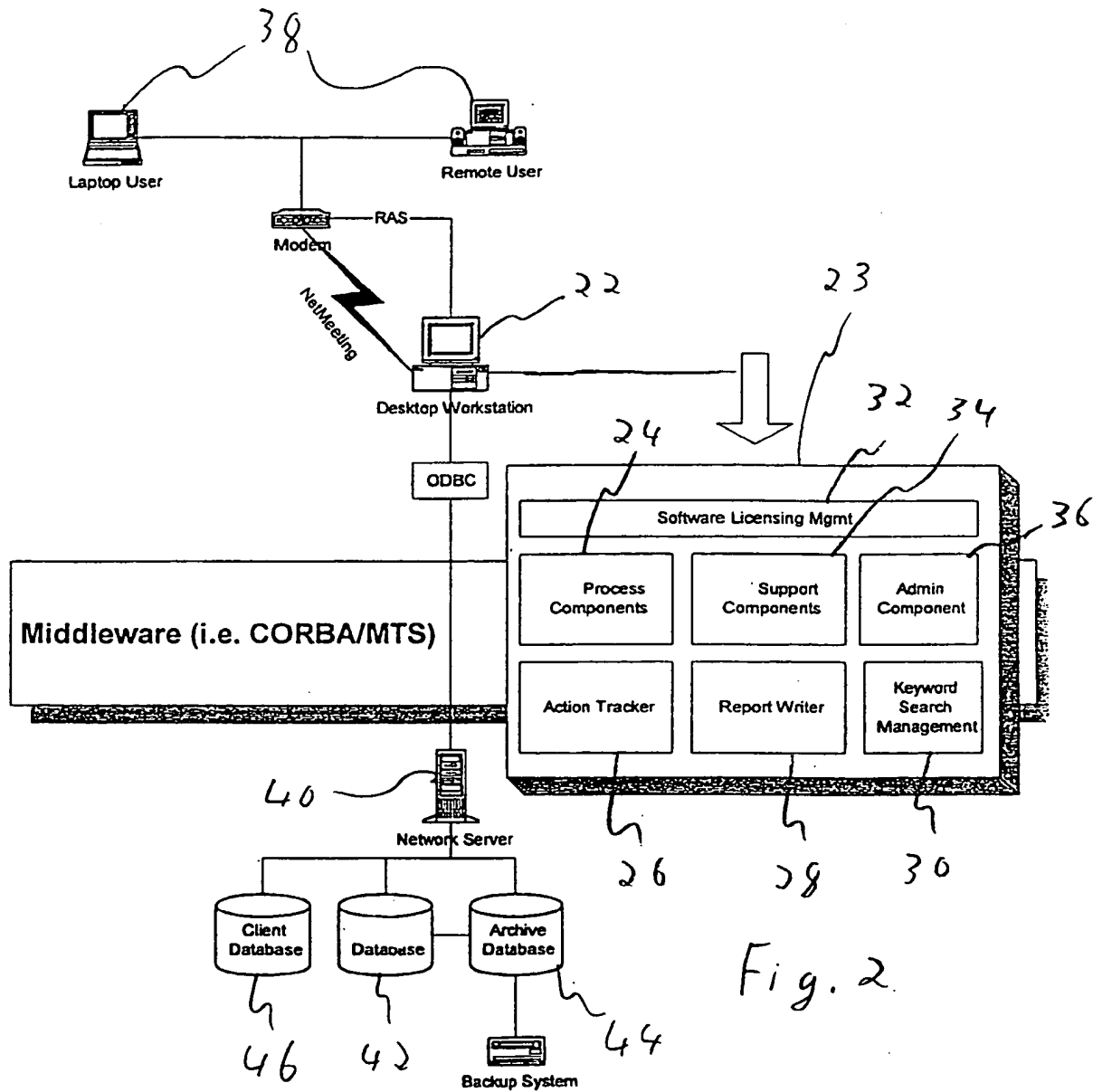


Fig. 1



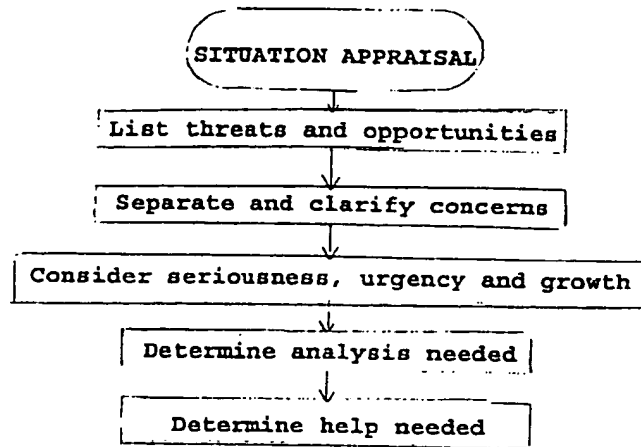


Fig. 3

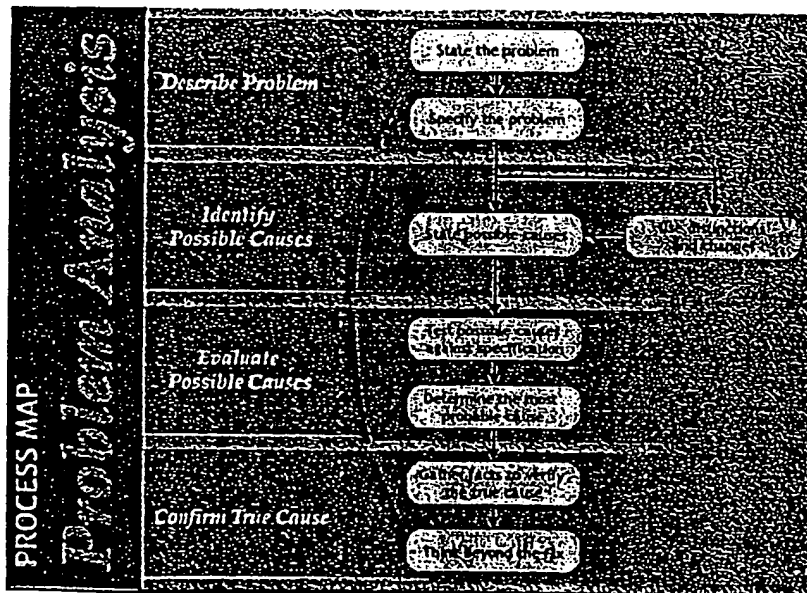


Fig. 4

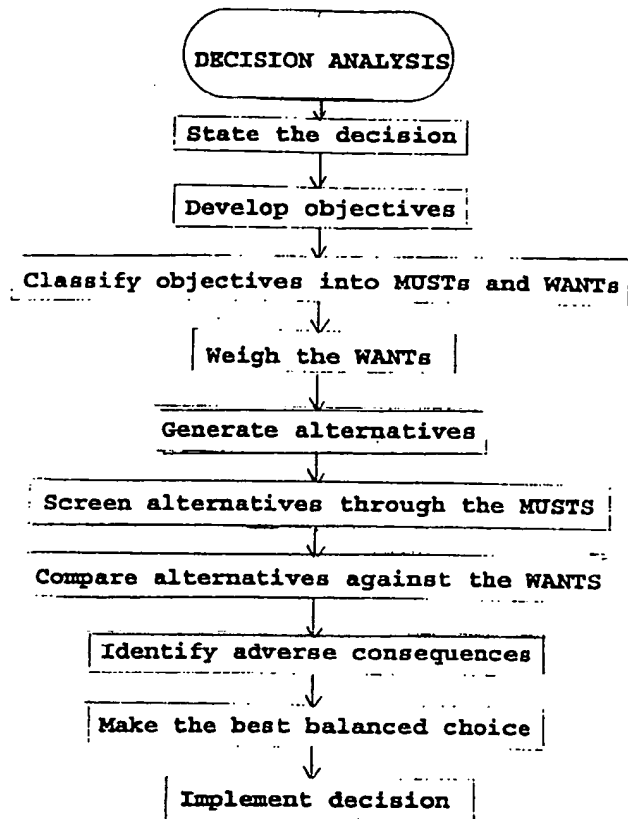


Fig. 5

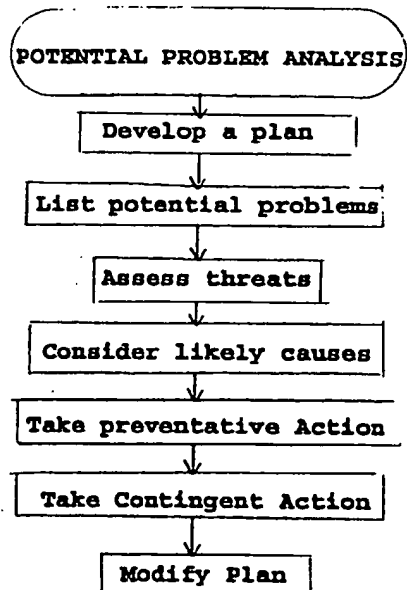


Fig. 6

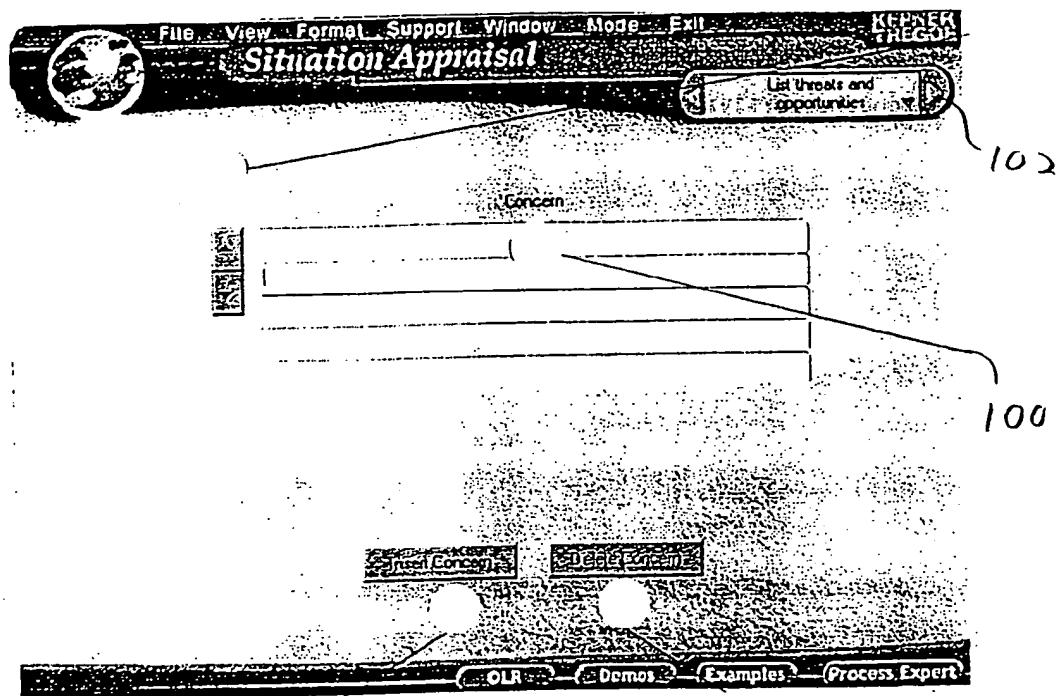


Fig. 7

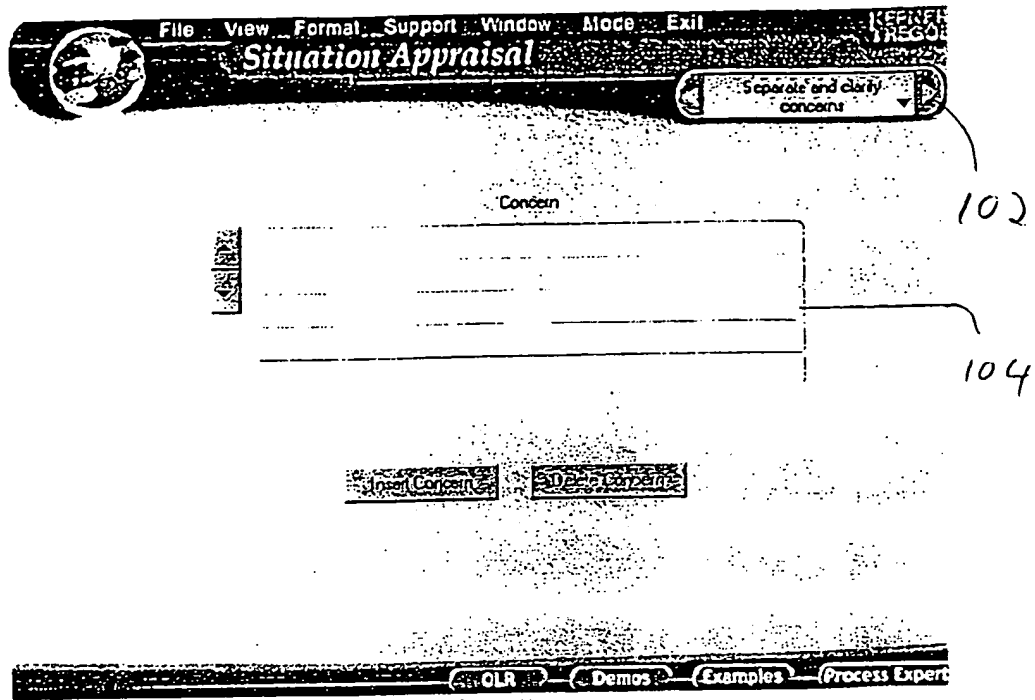


Fig. 8

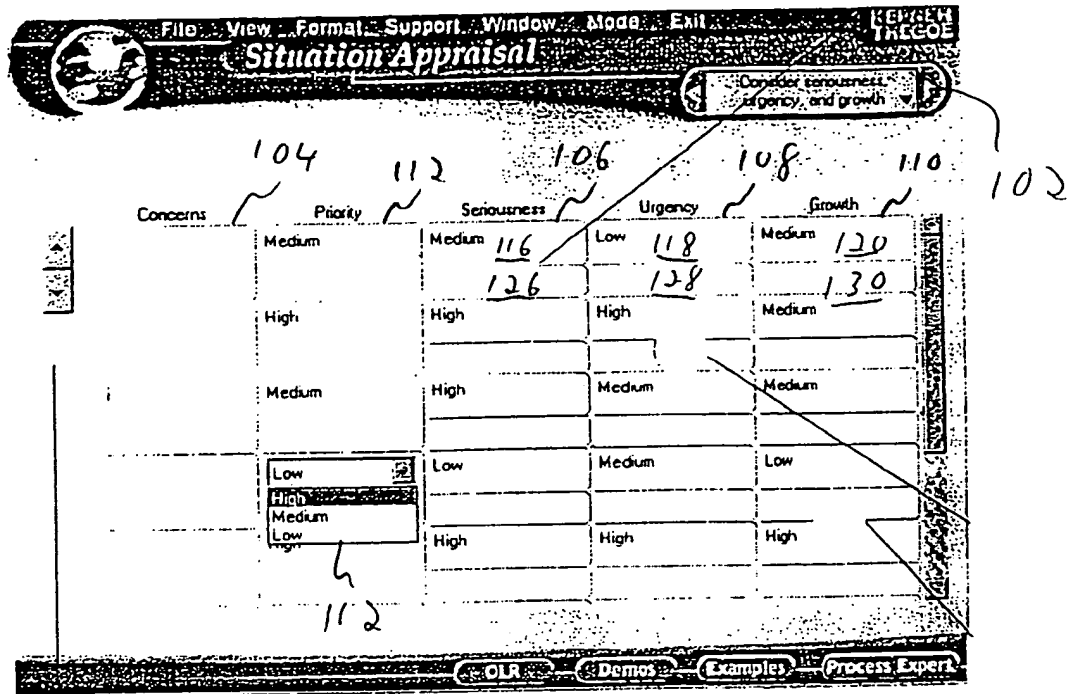


Fig. 9

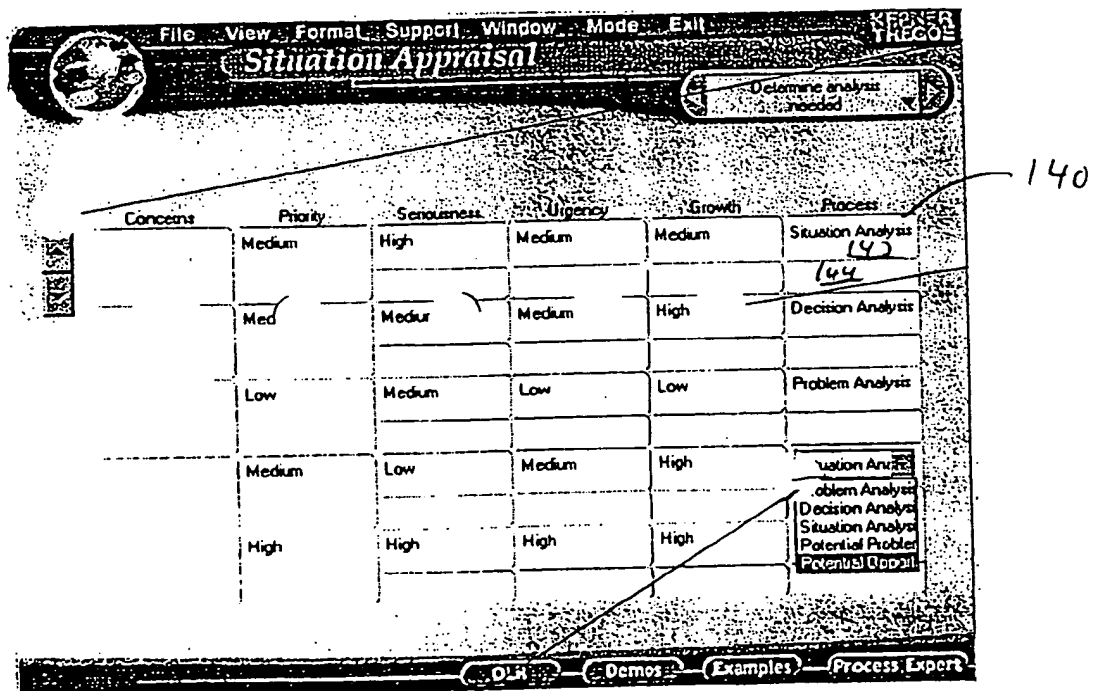


Fig. 10



File View Format Support Window Mode Exit

**Situation Appraisal**

Determine help needed

Concerns	Priority	Seriousness	Urgency	Growth	Process
	Medium	High	Medium	Medium	Problem Analysis
	Medium	Medium	Medium	High	Decision Analysis
	Low	Medium	Low	Low	Problem Analysis

154 Action 156 Who 158 When 160 Notes 162 Status 164

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150

152

Fig. 11

File View Format Support Window Mode Exit

**Problem Analysis**

What should be happening?

What is actually happening?

Is the cause known? ☐ Yes ☐ No

What tells you the cause is unknown?

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206

208

Fig. 12

File View Format Support Window Mode Exit

**Problem Analysis**

Object Deviation

What object?

What deviation?

Where geographically?

Where on the object?

When first?

When since?

When in the...

How many objects?

What is the size?

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216

220

218

Fig. 1.3

File View Format Support Window Mode Exit

Problem Analysis

Object Deviation

Problem: \_\_\_\_\_

Is Is Not Distinction Change

What object?

What deviation?

Where geographically?

Where on the object?

When first?

When since?

When in the life cycle?

Collapse Insert Object Insert Distinction Insert Change

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214 212 230 228 216 218 224 226 Fig. 14

File View Format Support Window Mode Exit

Problem Analysis

Object Deviation

Problem: \_\_\_\_\_

Is Is Not Distinction Change

What object?

What deviation?

Where geographically?

Where on the object?

When first?

When since?

When in the life cycle?

Collapse Insert Object Insert Distinction Insert Change

OLR Demos Examples Process Expert

232 234 236 Fig. 15

File View Format Support Window Mode Exit

**Problem Analysis**

Problem:  Object:  Deviation:

What object?  Is  Is Not  Condition:  Assumptions or Notes:

What deviation?  only if

Where geographically?  yes because

Where on the object?  only if  yes because  no because

When first?

Probability:

Assumptions or Notes:

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Fig. 16

File View Format Support Window Mode Exit

**Problem Analysis**

Object:  Deviation:

Probability:  Possible Causes:

MPC

None

High

Medium

Low

No assumptions necessary.

No assumptions necessary.

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Fig. 17

File View Format Support Window Mode Exit

Problem Analysis

Problem: Object Deviation

Possible Cause

Notes Action

Who When

New Cause Find Cause Print Cause

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Fig. 18

File View Format Support Window Mode Exit

Problem Analysis

Problem: Object Deviation

Confirmed True Cause

What other damage could this cause?

Notes Action Who When

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Fig. 19

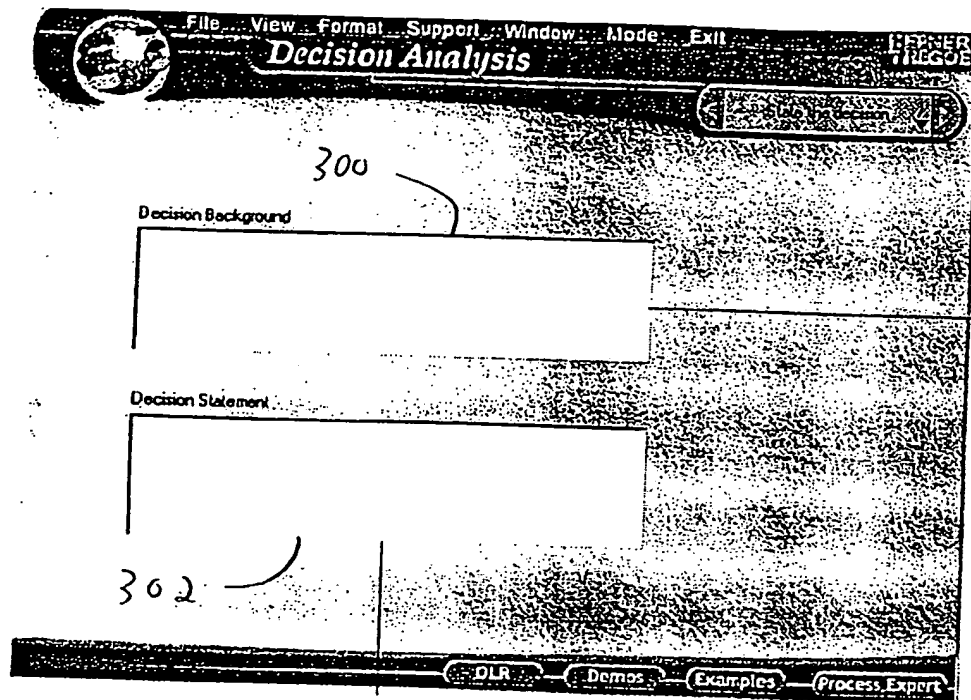
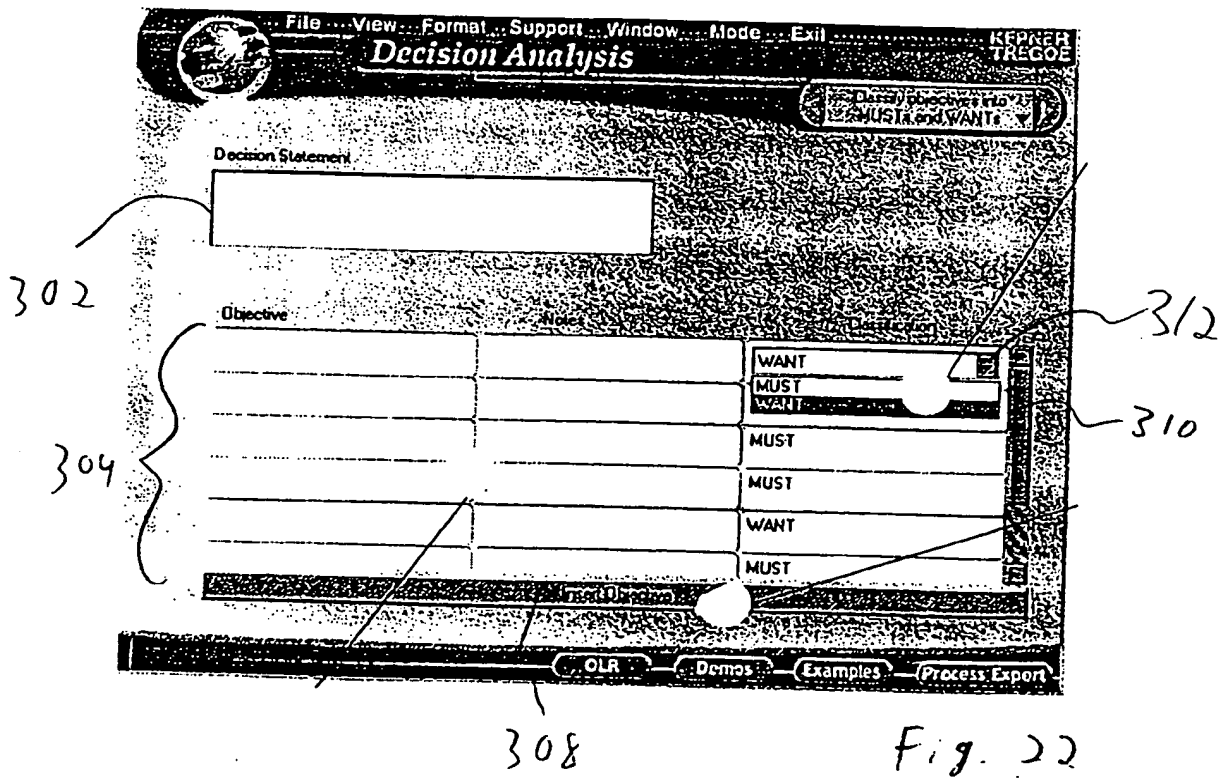
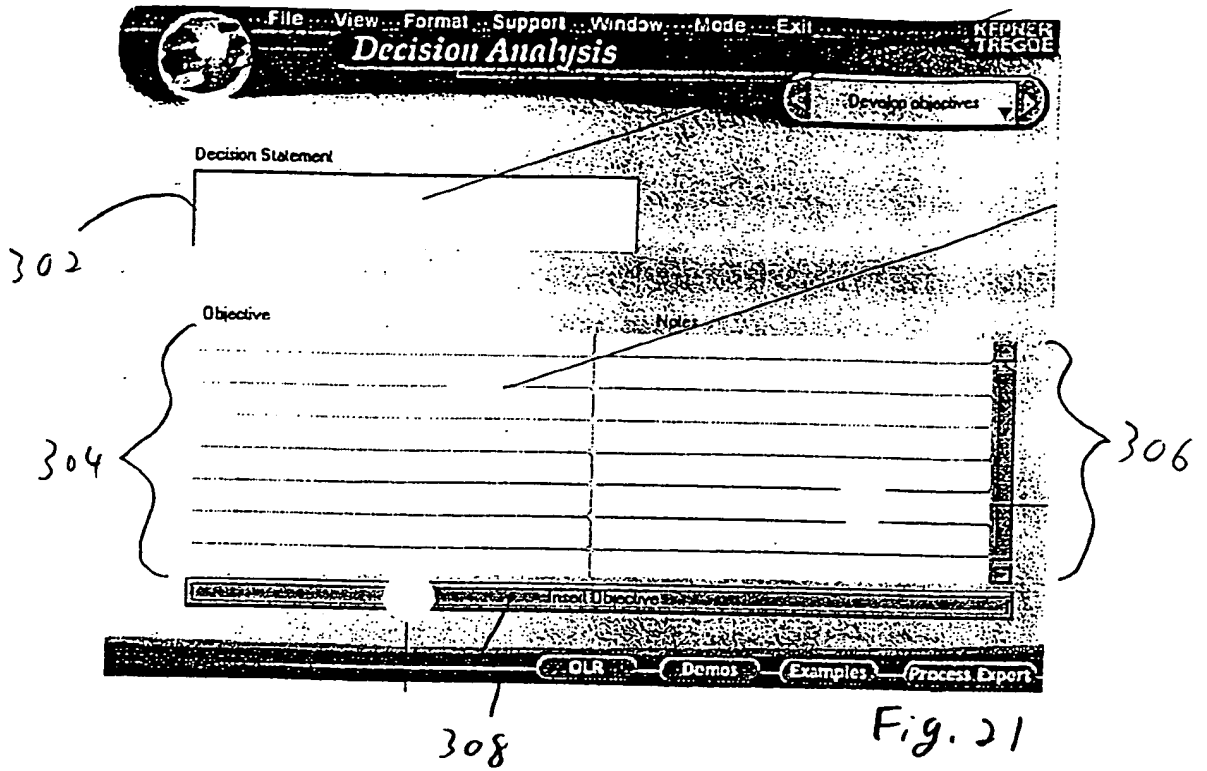


Fig. 20



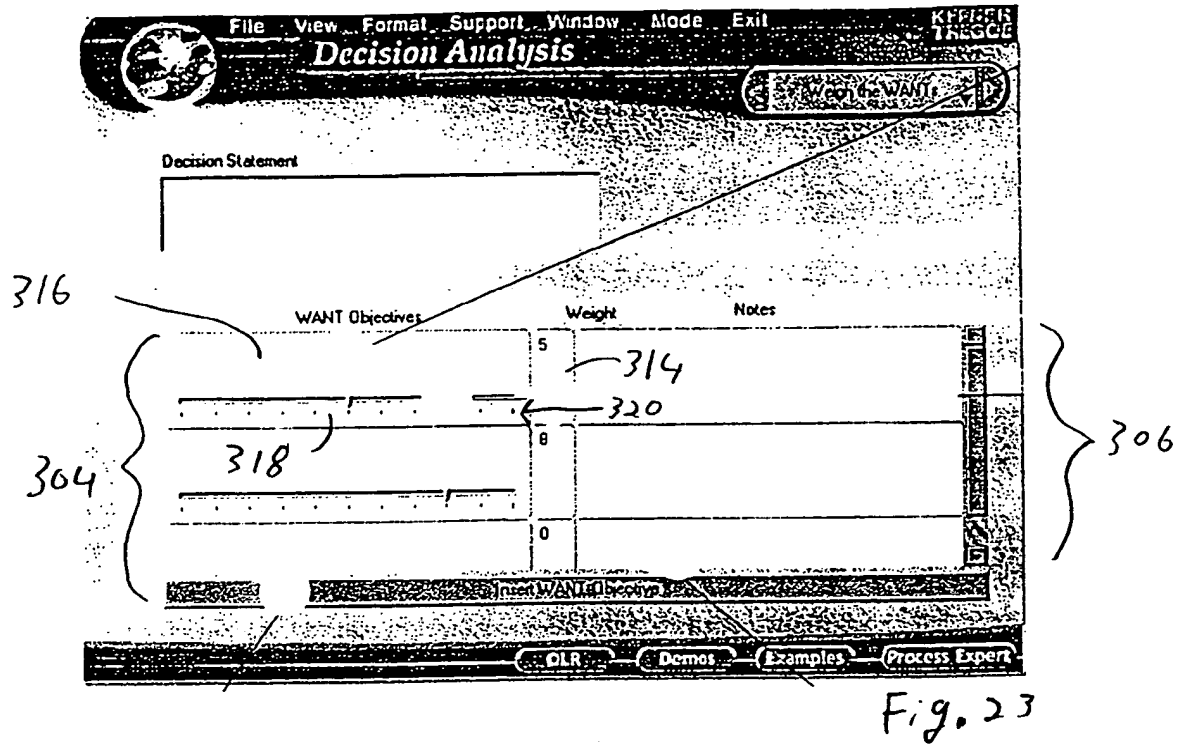


Fig. 23

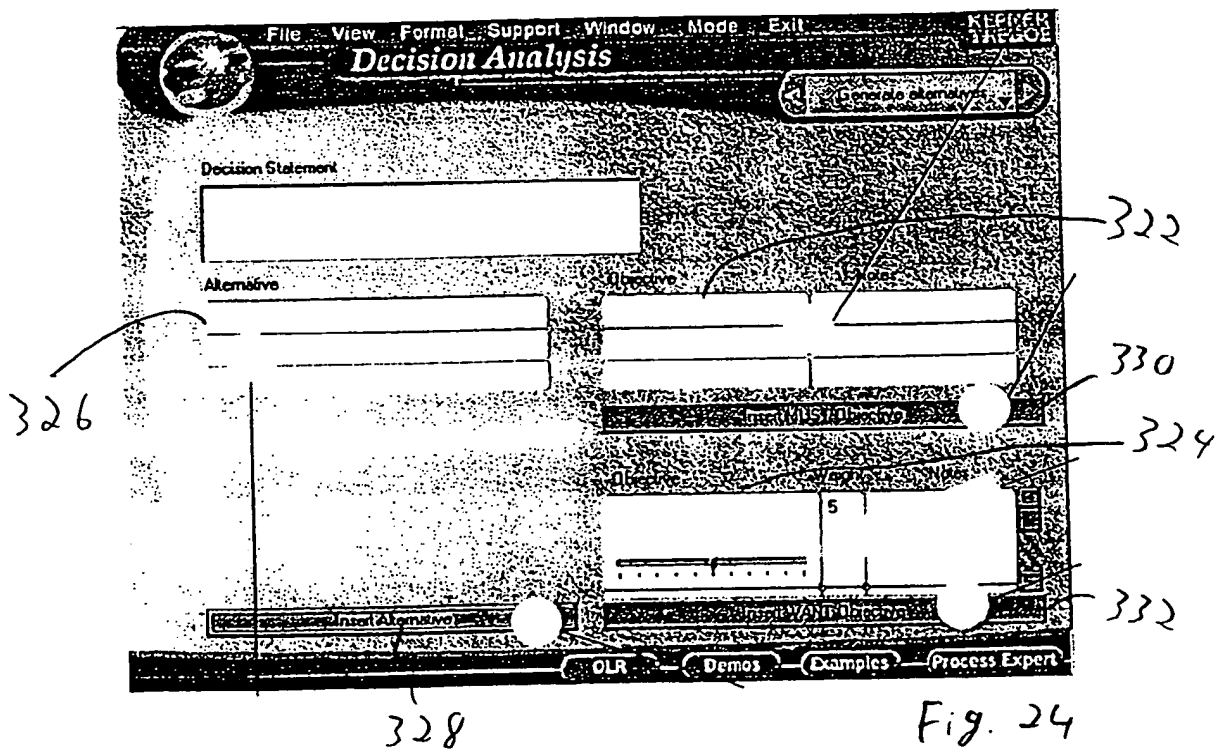
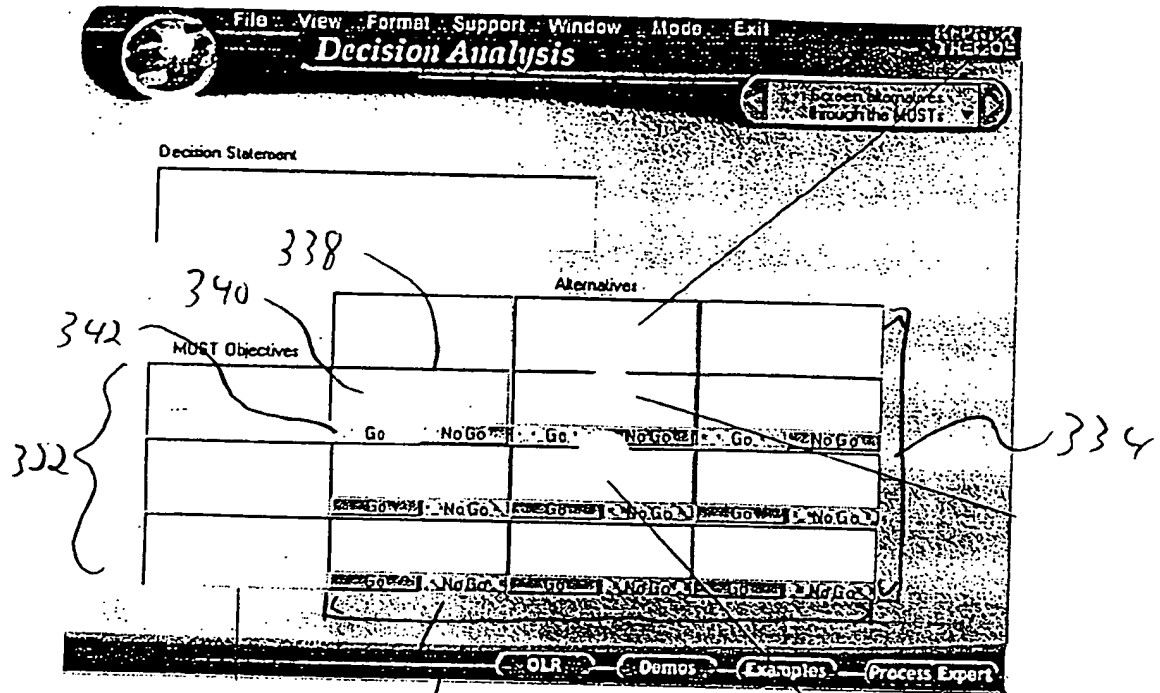


Fig. 24





336

Fig. 25

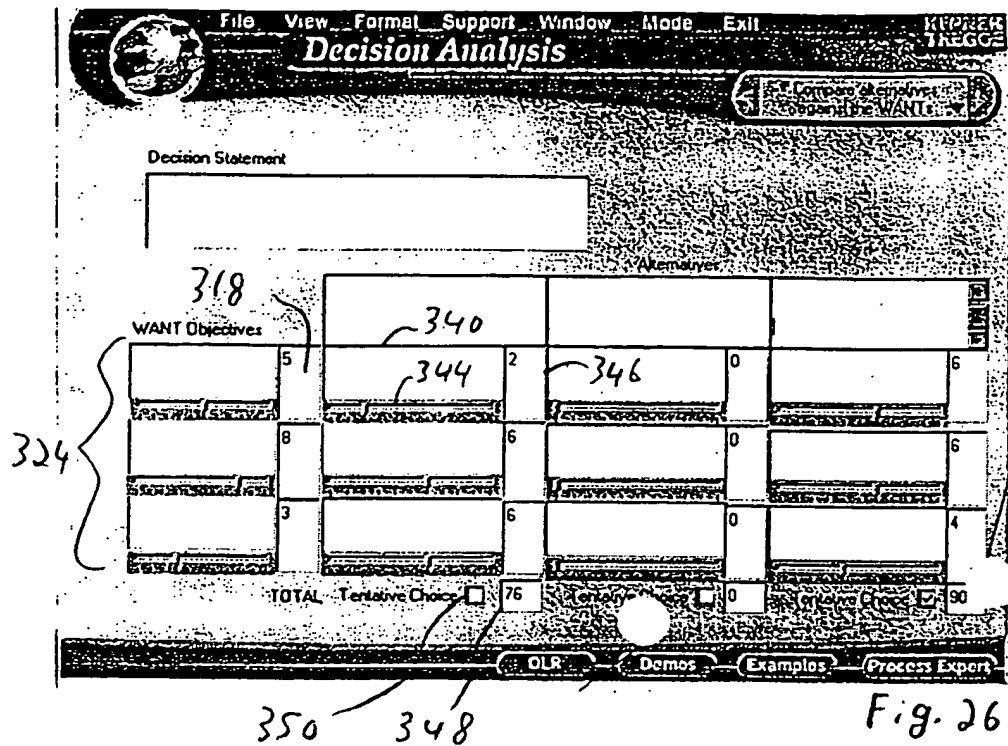


Fig. 26

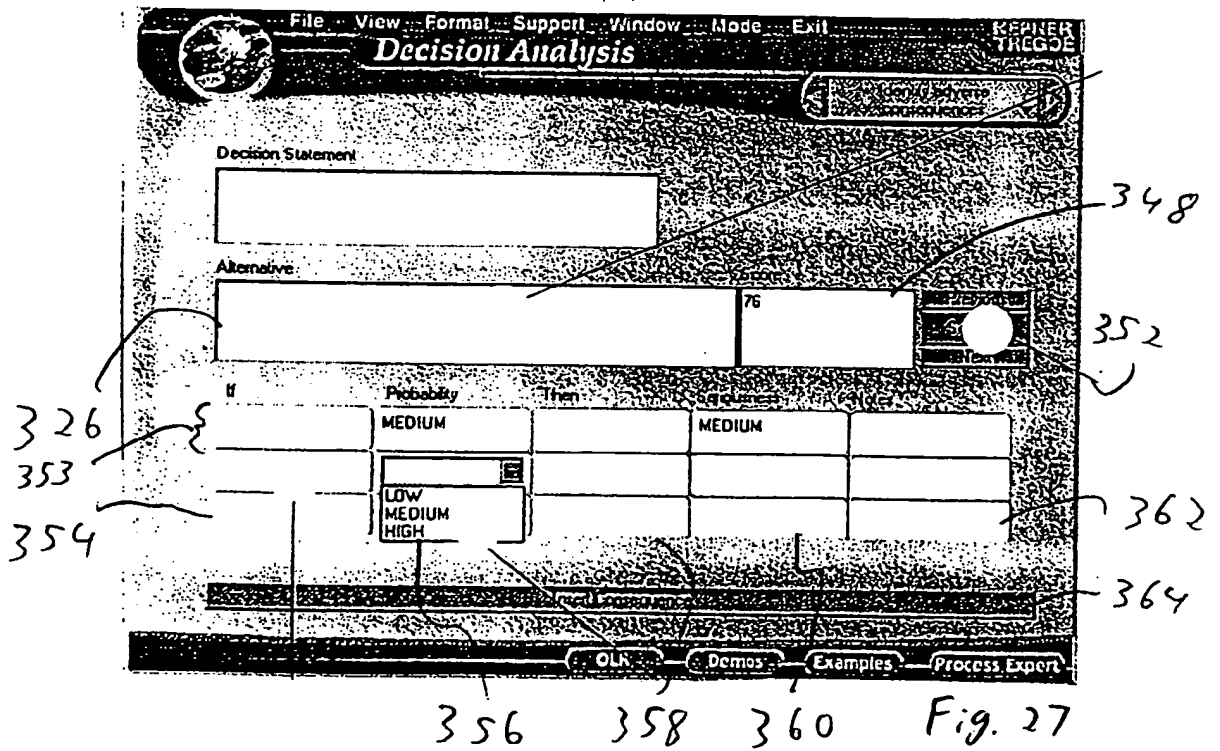


Fig. 27

**Decision Analysis**

File View Format Support Window Mode Exit

Make the best balanced choice

Decision Statement: [Text Box]

Decision Alternative: [Text Box]

Score: 90

Want Objectives: [Text Box]

Weight: 5

Notes: [Text Box]

Previous

324

326

353

366

368

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Fig. 28

**Decision Analysis**

File View Format Support Window Mode Exit

Implement decision

Decision Statement: [Text Box]

Final Decision: [Text Box]

Notes: [Text Box]

Notes

372

374

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382 376 378 380 Fig. 29

File View Format Support Window Mode Exit

**Potential Problem Analysis**

Develop a Plan (400)

Action Statement

Action Plan

Action	Notes	Who	When

402

404 406 408

Insert Action (410)  
Insert Problem (412)

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Fig. 30

File View Format Support Window Mode Exit

**Potential Problem Analysis**

List Potential Problems (403)

Action Statement

Action Plan

Action	Notes	Who	When

414

Potential Problems

416

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Fig. 31

File View Format Support Window Mode Exit

Potential Problem Analysis

Access Threats

Action Statement

403

404 Action

406 Notes

408 Who

410 When

414

422 Priority

416 Potential Problem

418 Probability

420 Seriousness

Port Problem

OLR Demos Examples Process Expert

424

Fig. 32

File View Format Support Window Mode Exit

**Potential Problem Analysis**

Consider Likely Causes

Action Statement

403

404 Action Plan 408 Who

406

414

406 Likely Causes

430

432

434

426 428

Personnel

OLR Demos Examples Process Expert

436 Fig. 33

File View Format Support Window Mode Exit

**Potential Problem Analysis**

Taking Preventative Action

Action Statement

Action	Notes	Who	When

Preventative Actions

Priority	Potential Problem	Likely Cause	Preventative Action

Insert Likely Cause Insert Preventative Action

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Fig. 34

File View Format Support Window Mode Exit

**Potential Problem Analysis**

Taking Contingent Actions

Action Statement

Action	Notes	Who	When

Contingent Actions

Priority	Potential Problem	Contingent Action	Notes

Insert Contingent Action Insert Notes

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439 442 440 444

Fig. 35

The screenshot shows the main window of the "Potential Problem Analysis" software. At the top is a menu bar with options: File, View, Format, Support, Window, Mode, Exit. Below the menu bar is a title bar that reads "Potential Problem Analysis". On the right side of the title bar is a button labeled "Modify Plan...". The main area of the window contains a large rectangular box for notes or action plans. Above this box are four column headers: "Action", "Notes", "Who", and "When". To the right of the main box is a vertical toolbar with several icons. At the bottom of the window is a status bar with five buttons: "Insert Action...", "Update Action Track", "Process Export", "Demos", and "Examples". A small globe icon is visible in the top left corner of the window.

514

KTActionTracker

File View Format Support Window Mode

Sort By: Concern

502

500

504

Action Files	Priority	Concern	Seriousness	Urgency	Growth	Process
My Actions		Confirm type cause				
Red Sweed PA		PA on dropping revenues	508	510		
Department SA						
Tamworth PA						

512

527

526

518

520

Sort By: Who

522

524

516

Action	Who	When	Notes	Status
Perform chemical analysis on cleaning fluid		4-26-98	Fluid product #144458.b	
Check point on new life vests		4-25-98		

Fig. 37



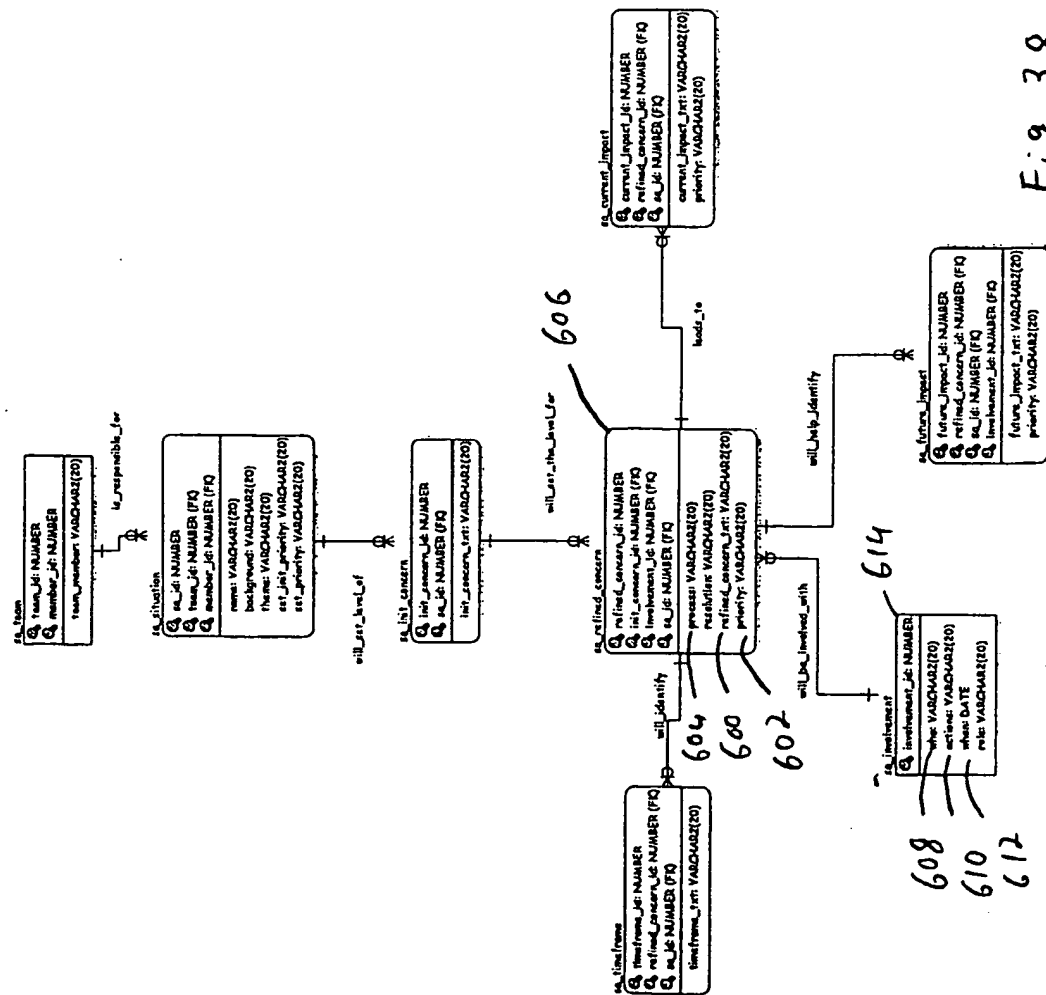
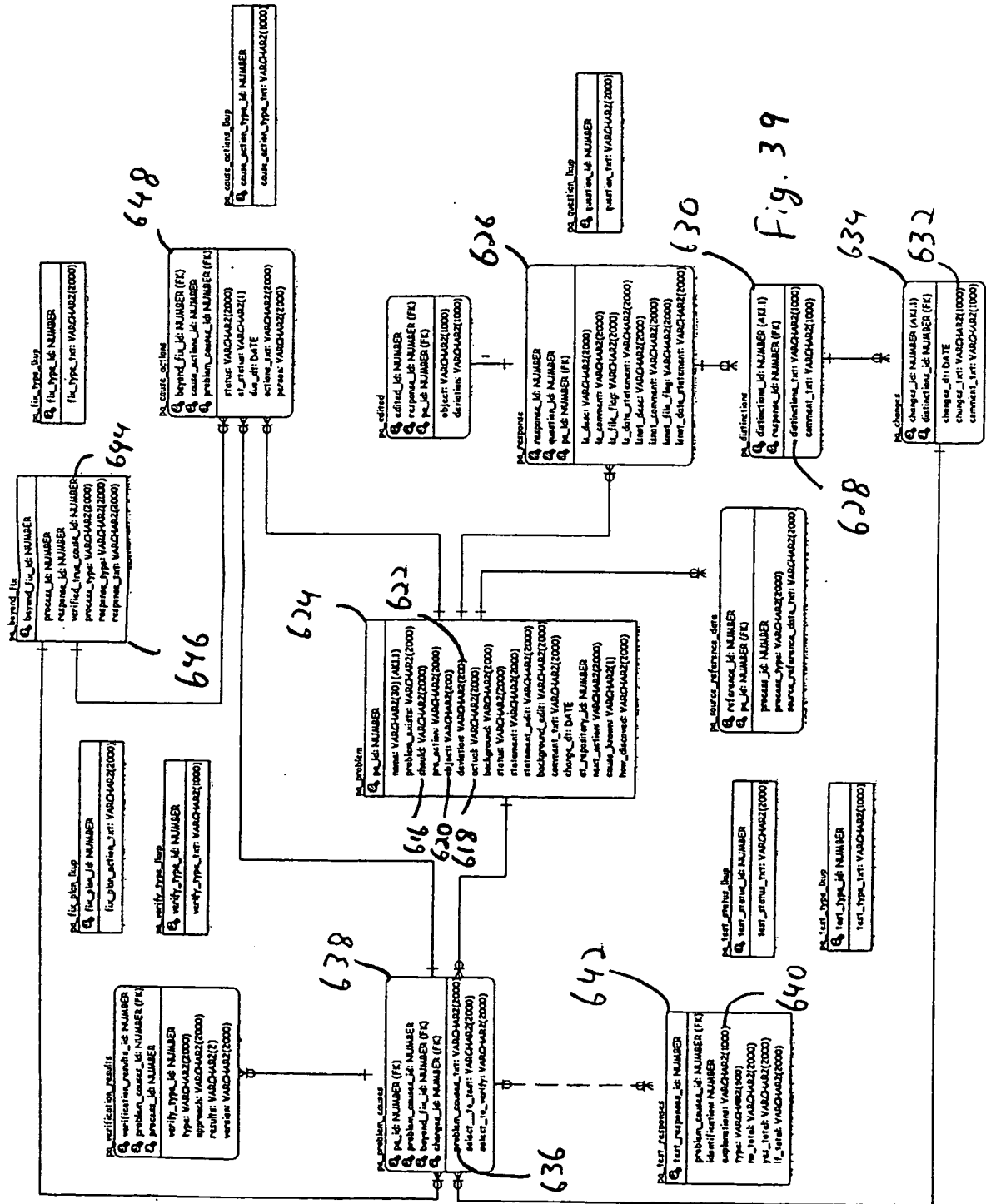


Fig. 38



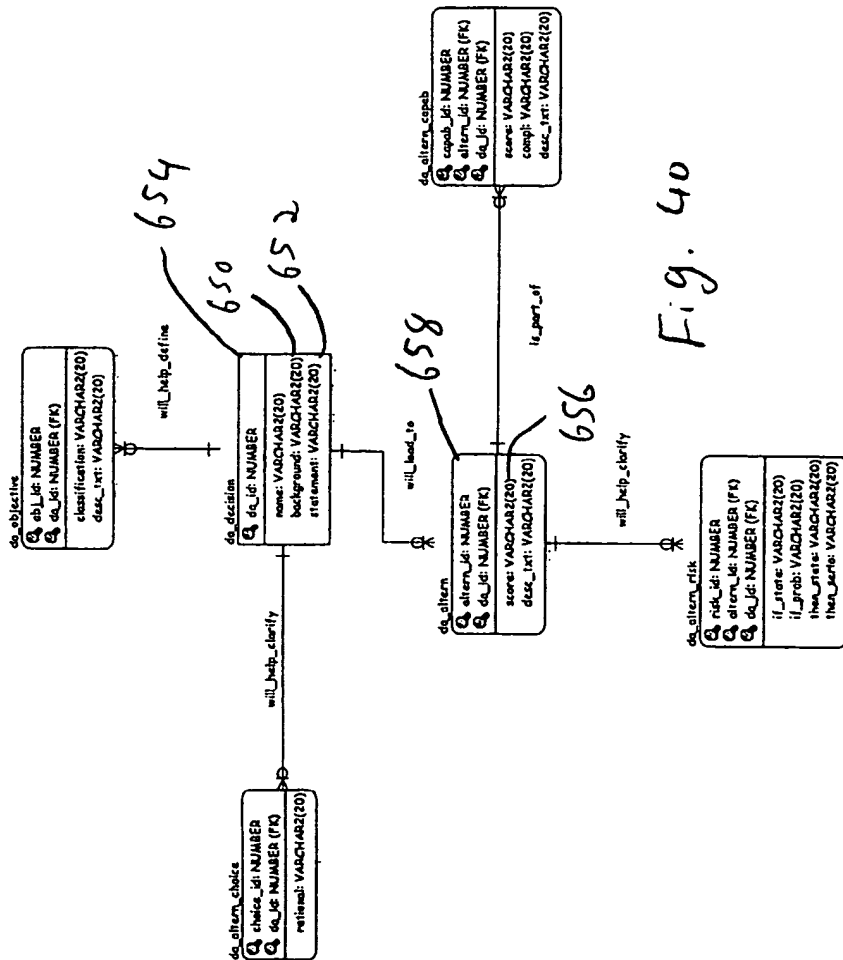
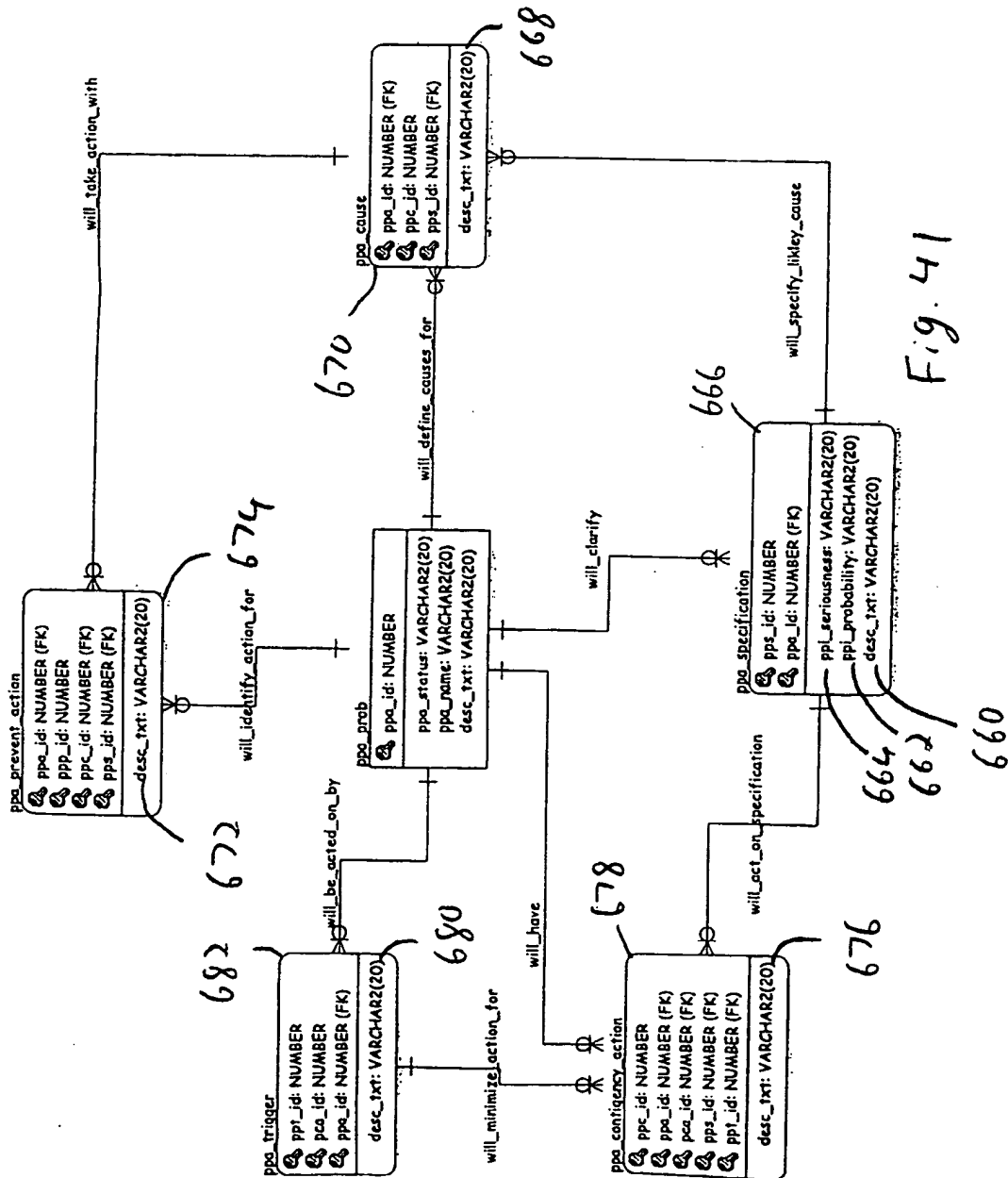
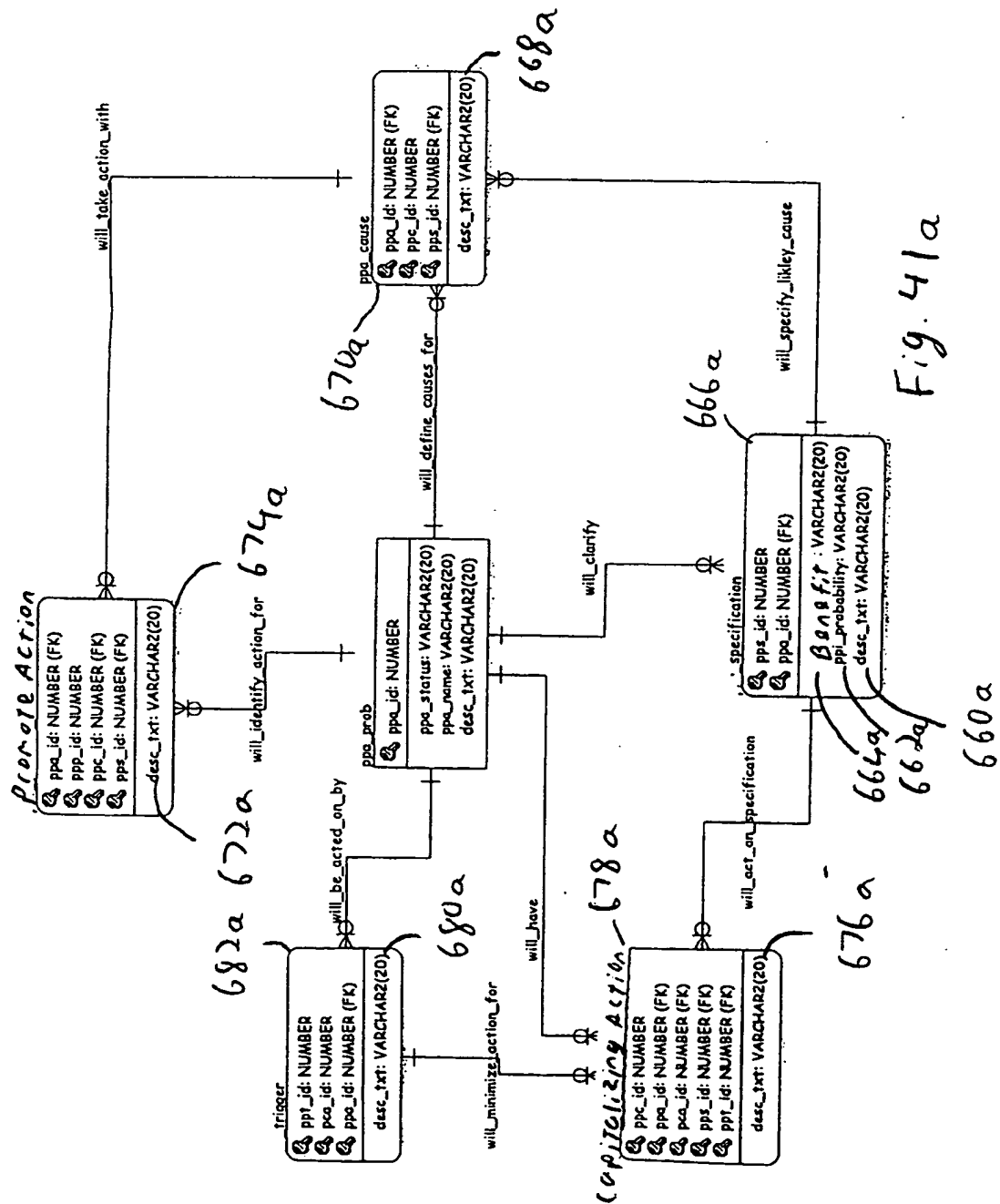


Fig. 40





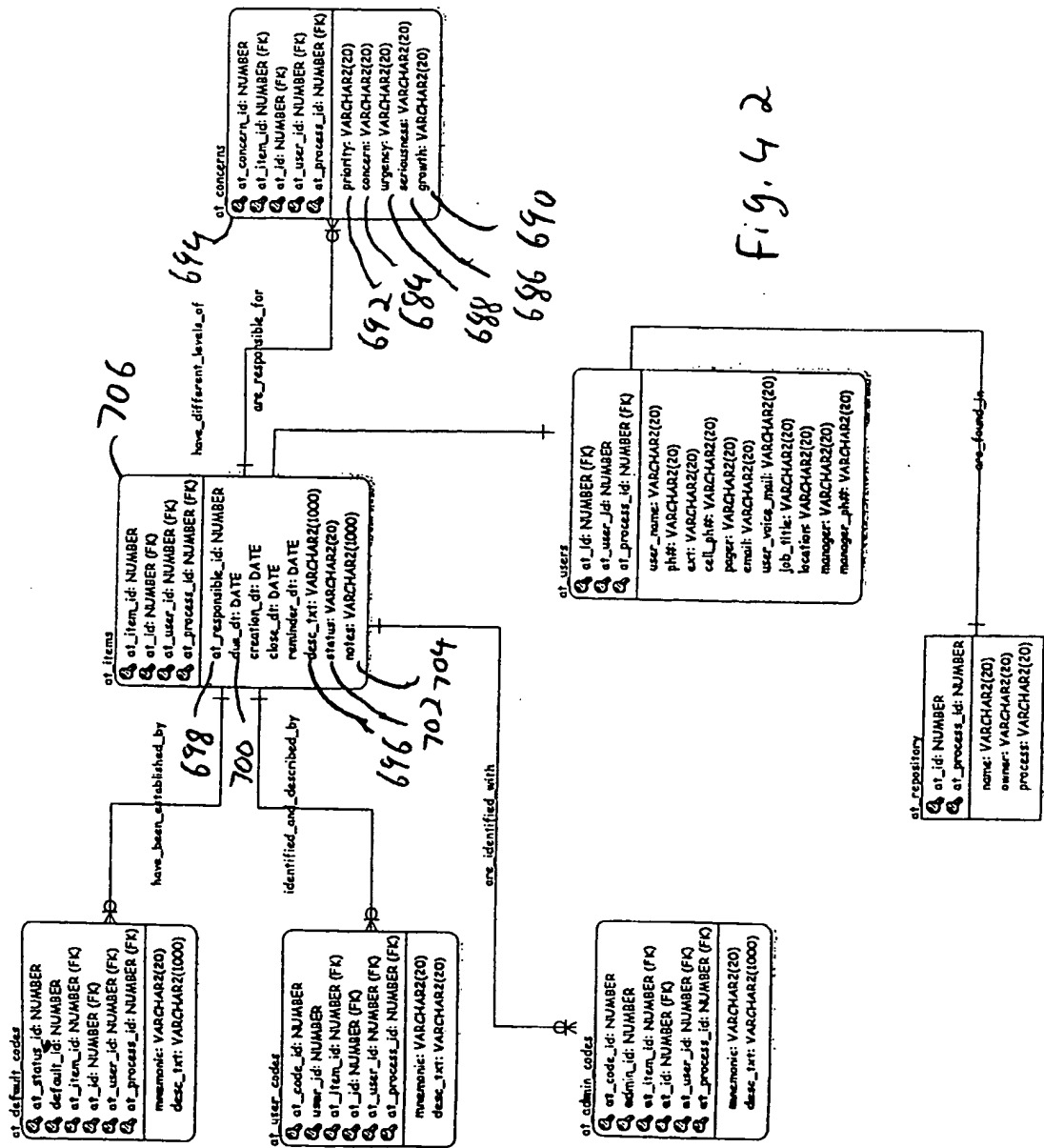


Fig. 42

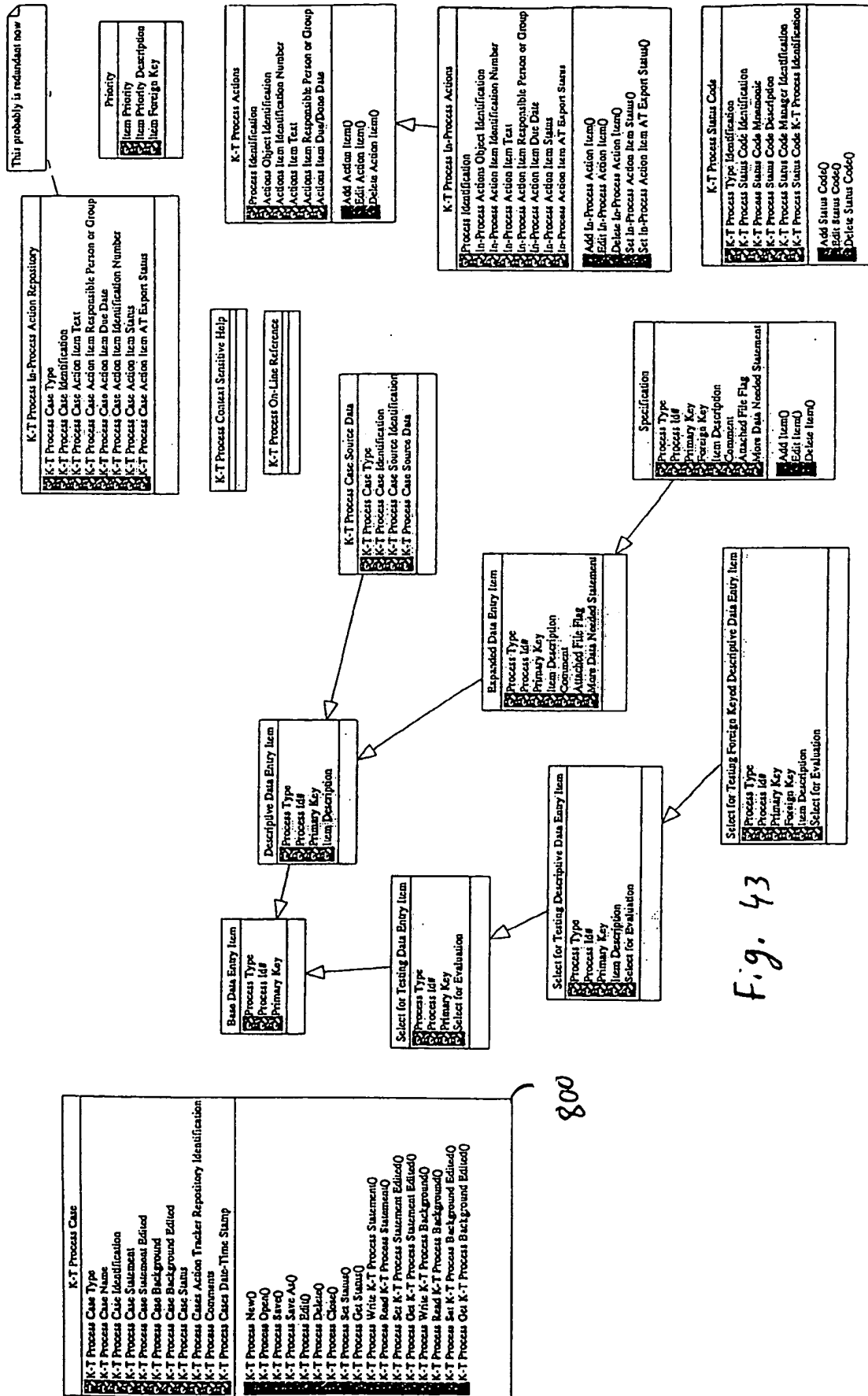
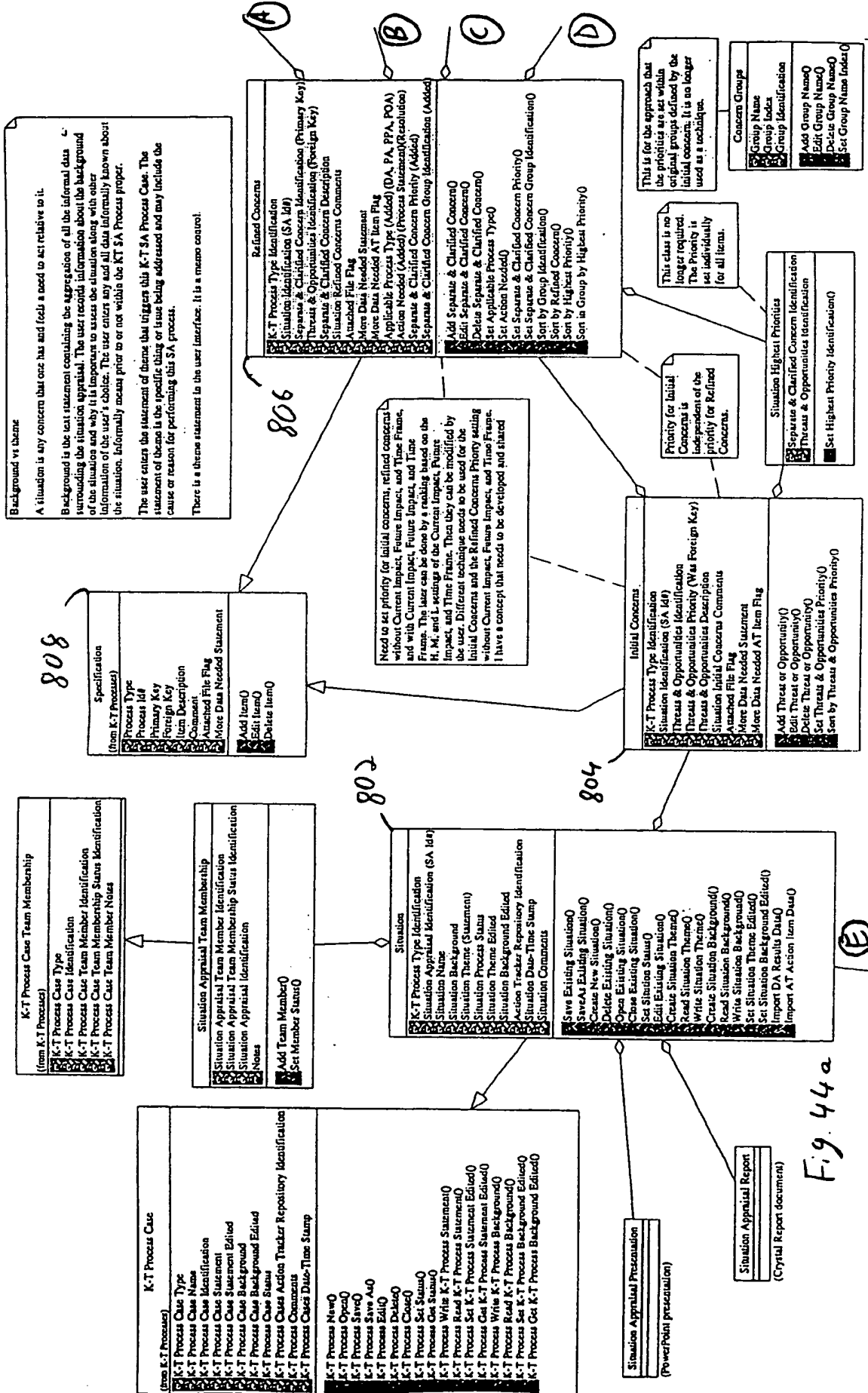


Fig. 43

800





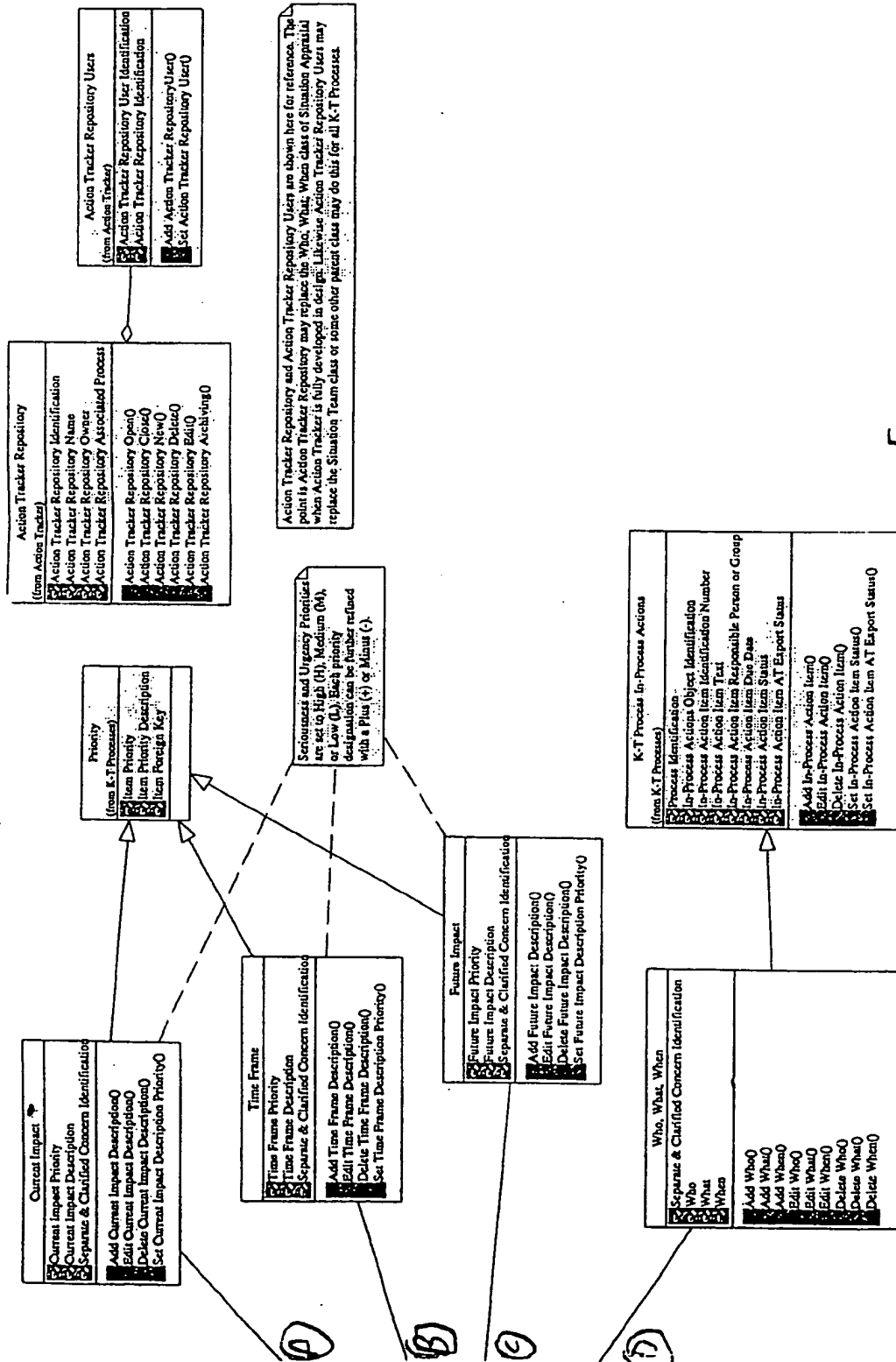


Fig. 44b

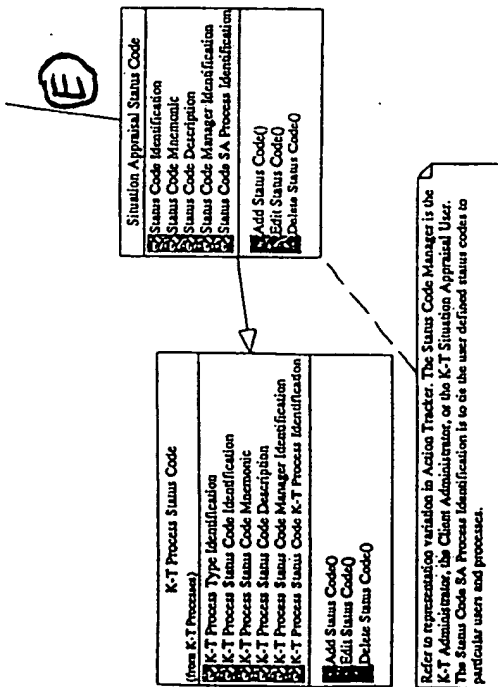


Fig. 44c

Establish priority:  
 Select a concern that seems to be the highest priority.  
 Select another and place it above or below the first concern in priority.  
 Select a third and place it relative to the first two concerns. Use drag and drop graphically.  
 Select additional concerns sequentially and place as above.  
 Select those that represent the group classified as H for High Priority and designate as such.  
 Select from the remainder those that represent the group classified as M for Medium Priority and designate as such.  
 The remainder are classified as L for Low Priority and are designated as such.

Karl,  
 As a follow up to our discussion, I want to confirm that we do need some type of ordering control in the SA grid on the initial "list concerns" screen. We may also want to allow this on the "separate and clarify" grid. However, in this case, the user could still only order the parent cells (with the children following the parent); they could not order children cells individually.  
 I can see where this functionality could be useful any time we have a single-column grid, such as in DA (List Objectives and List Alternatives) and PPA/POA (List Potential Problems/Opportunities).

Nikki

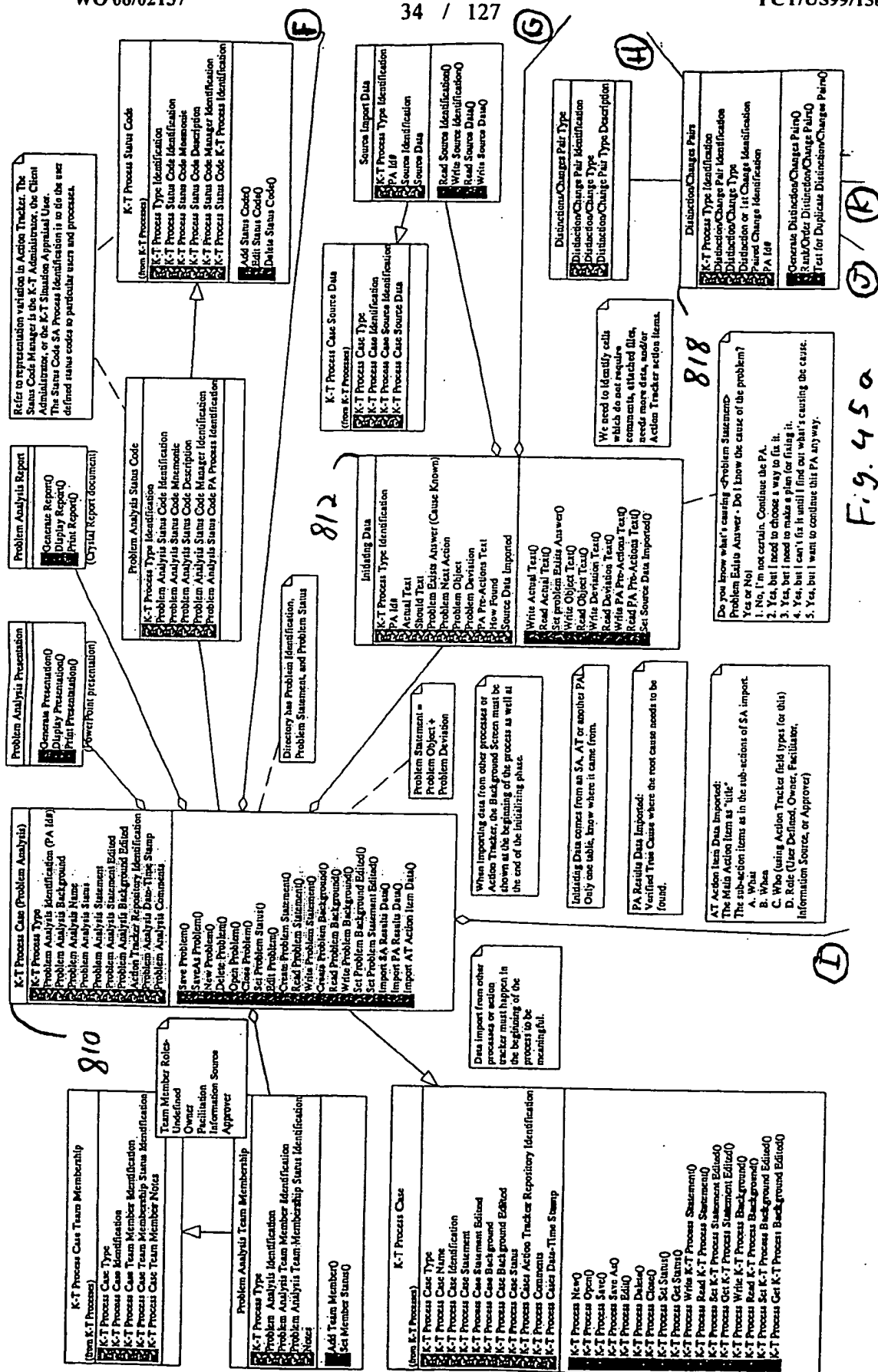
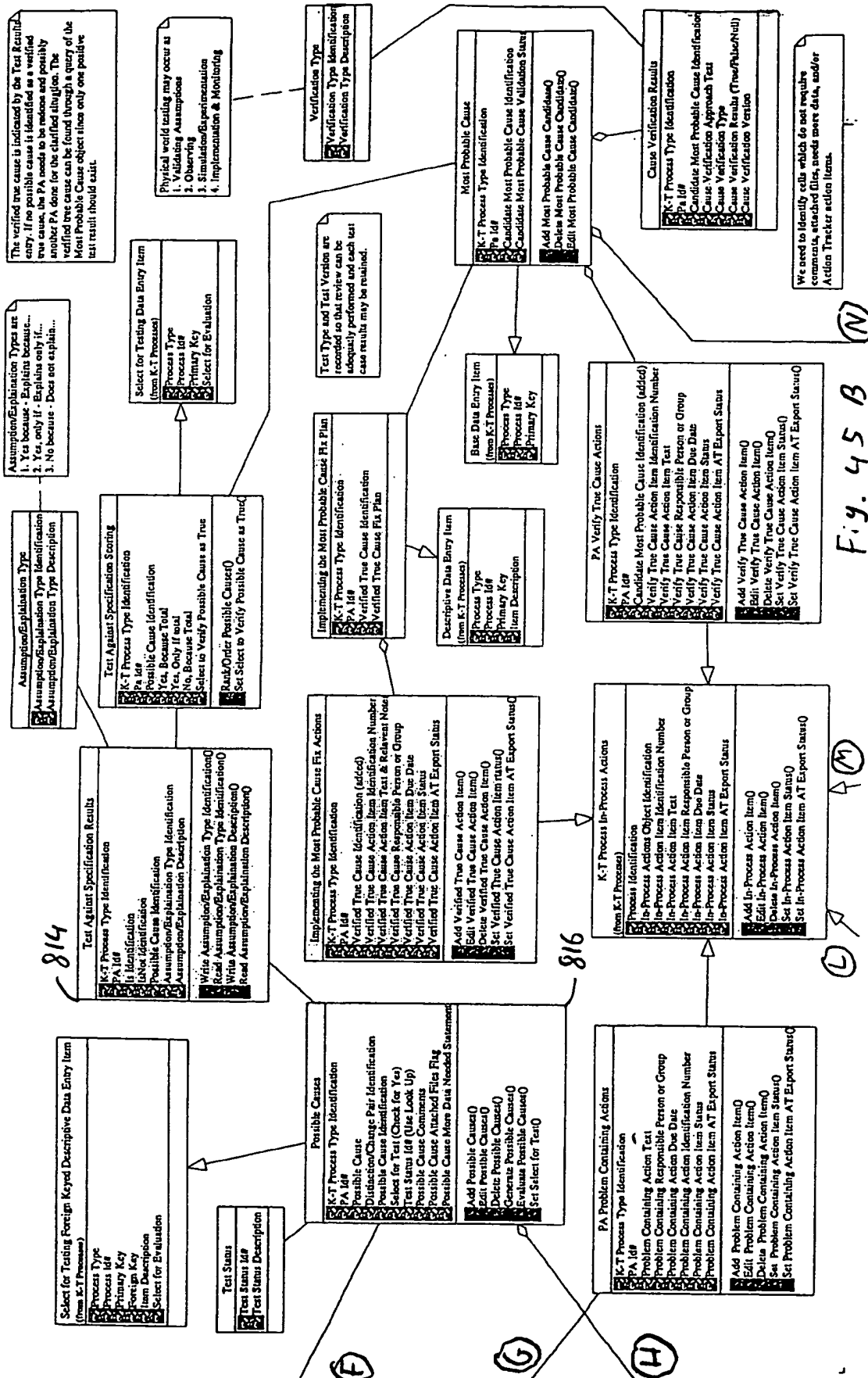


Fig. 45a



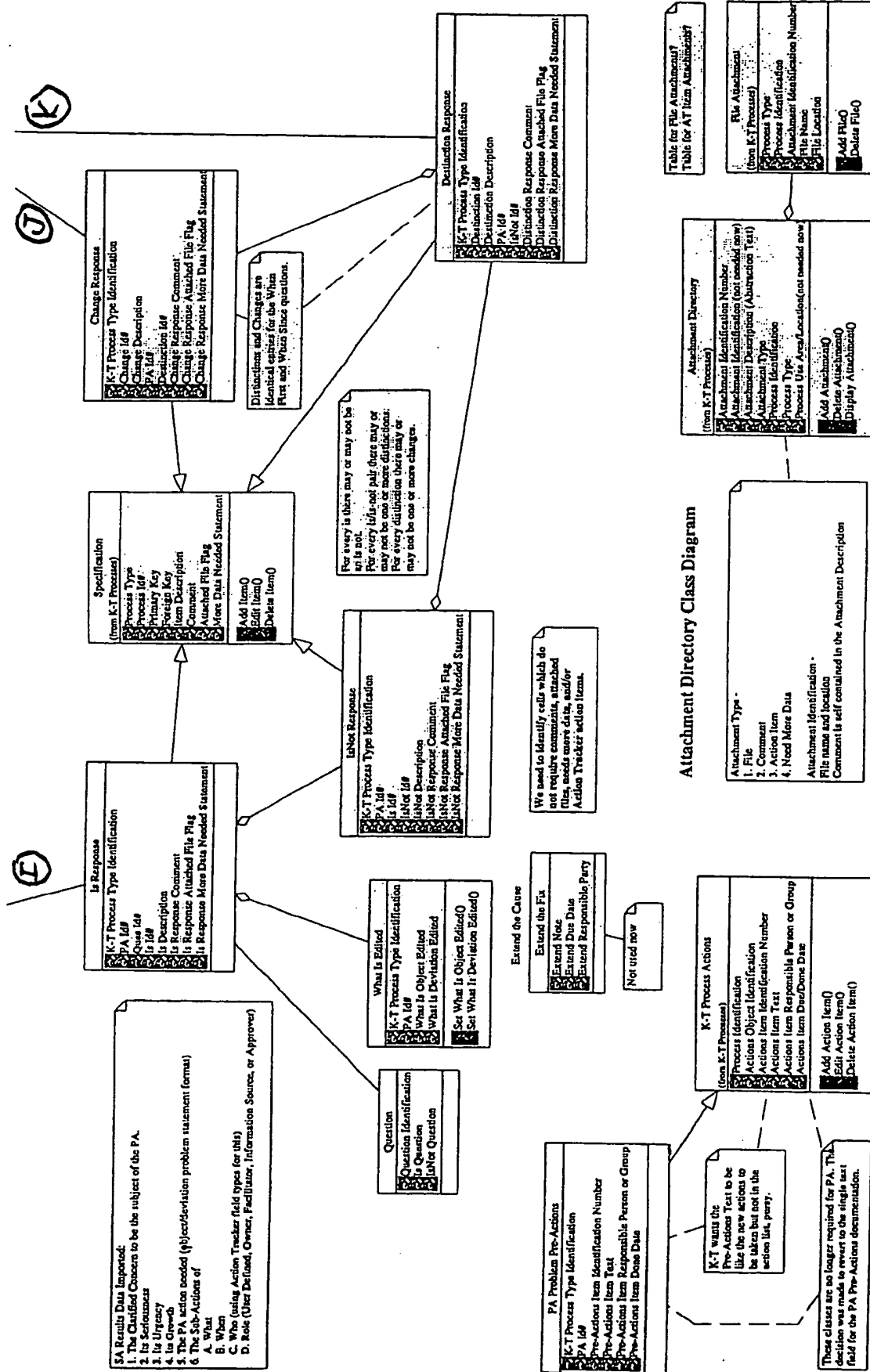


Fig. 45c

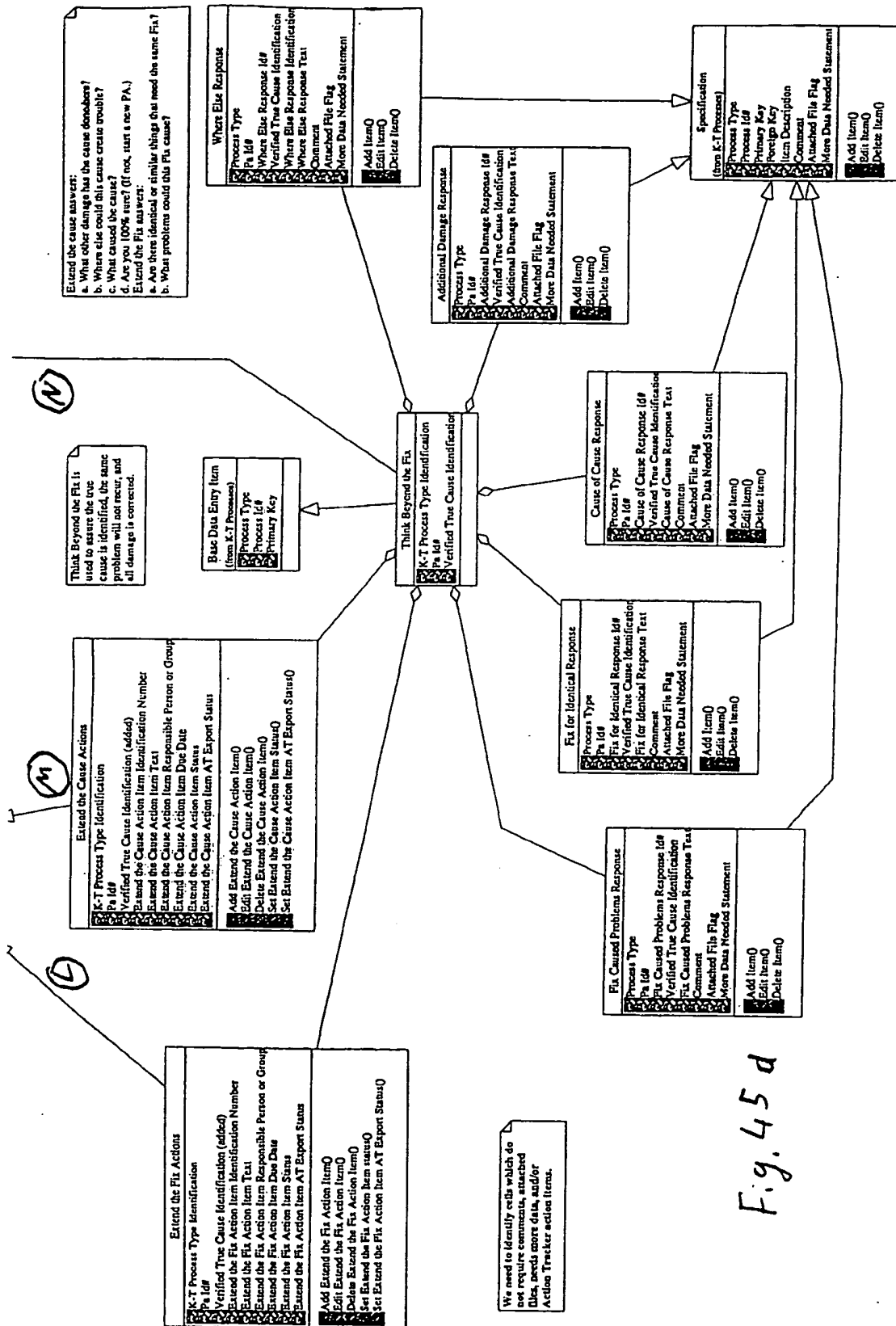
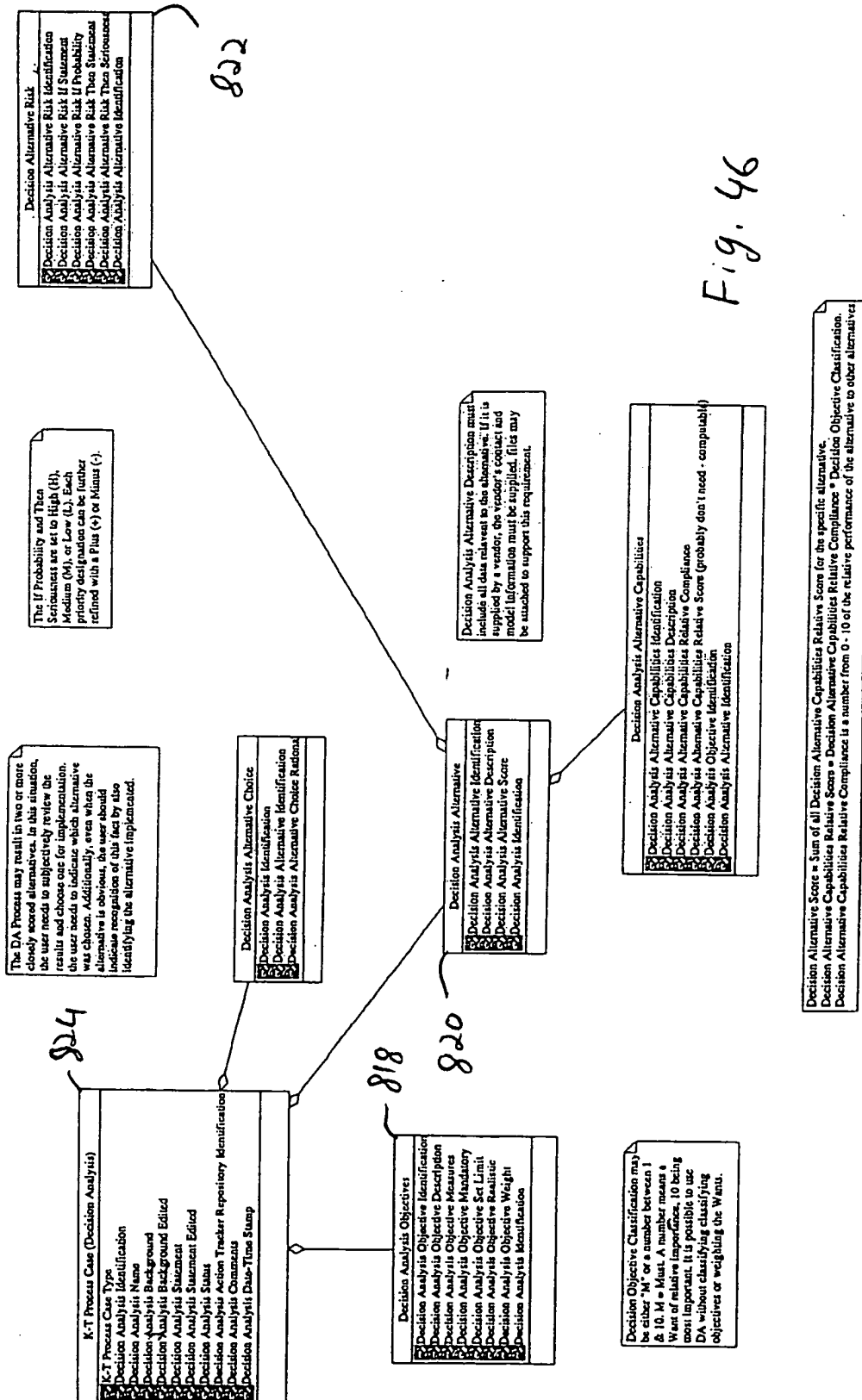
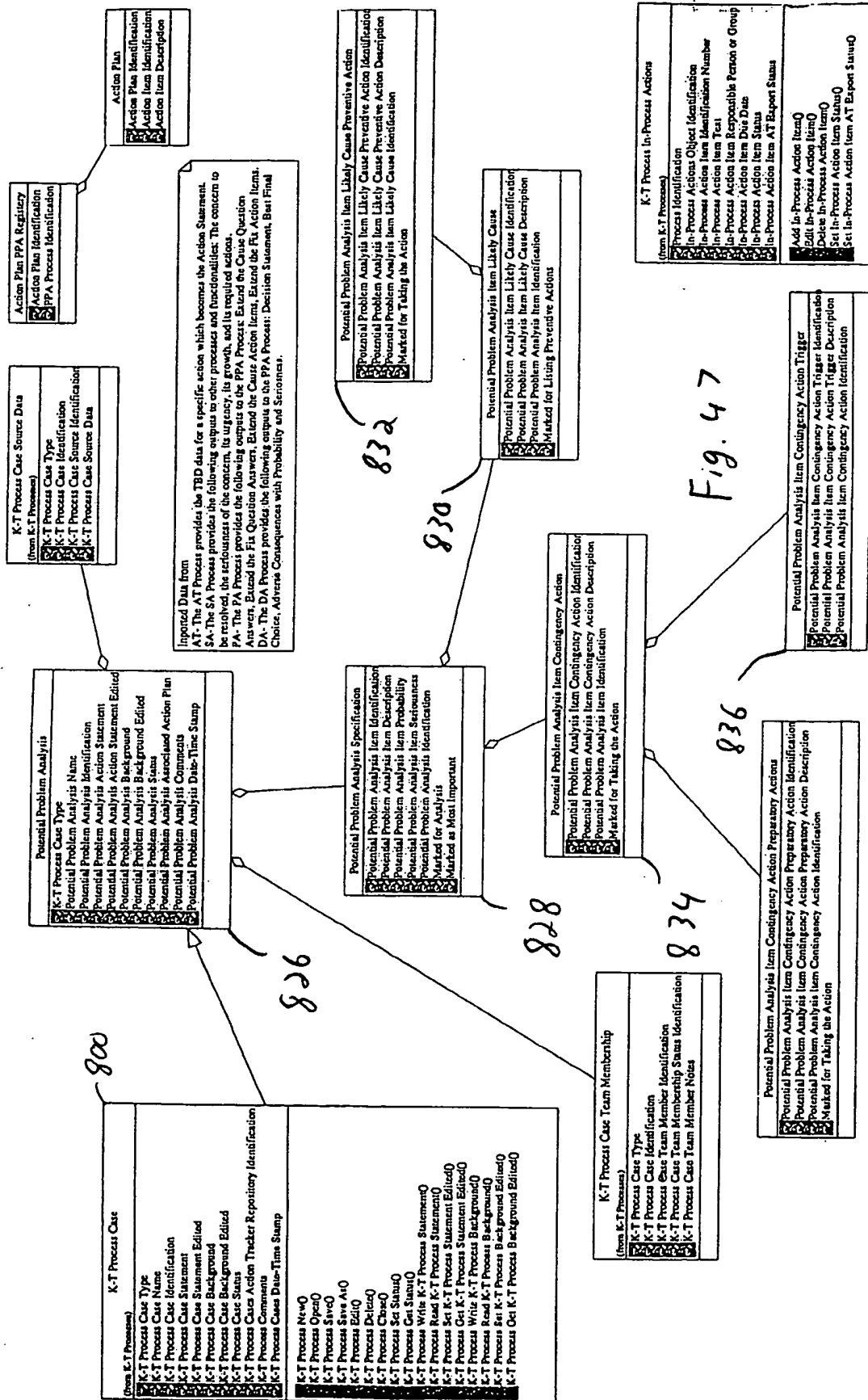
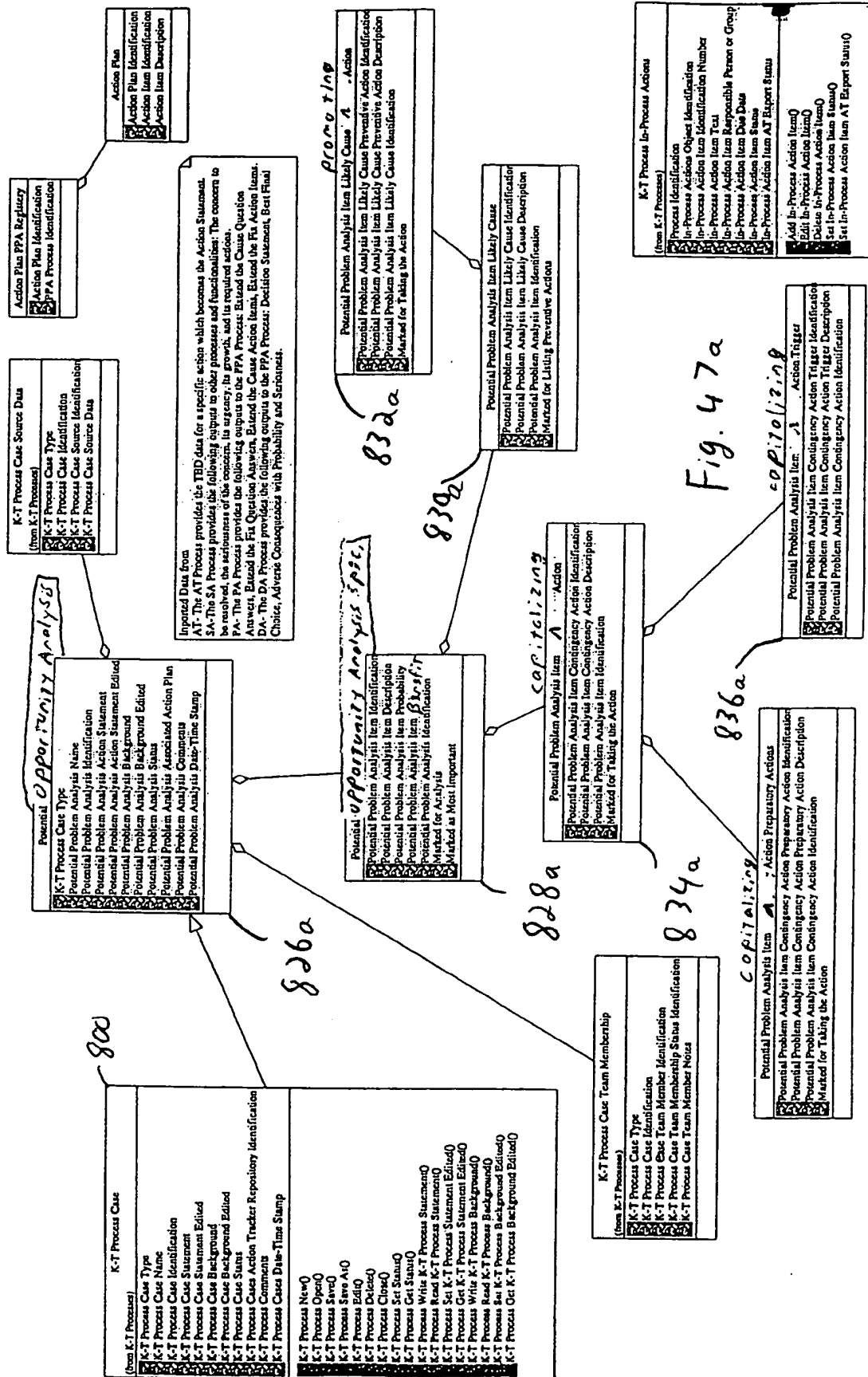


Fig. 45d











File View Format Support Window Mode Exit

**Potential Analysis**

opportunity

Develop a Plan

Action Statement

Action Plan

Action	Notes	Who	When

Insert Action

OLR Demos Examples Process Expert

900

902

904 906 908

910 912

Fig. 49

File View Format Support Window Mode Exit

**Potential Analysis**

opportunity

Potential Opportunities

Action Statement

Action Plan

Action	Notes	Who	When

Potential Opportunities

OLR Demos Examples Closed Opportunity

903

914

916

910 912

Fig. 50

File View Format Support Window Mode Exit

Potential Analysis

opportunity

Action Statement

Action Plan

Potential Opportunities

Priority

Potential

Probability

Benefit

OLR

Demos

Examples

Process Expert

Fig. 51

File View Format Support Window Mode Exit

REFNER THEGOE

Potential Analysis

opportunity

Consider Likely Causes

Action Statement

Action Plan

Action Notes Who When

Likely Causes

Priority Potential Likely Cause Probability

High, Medium, Low

High, Medium, Low

High, Medium, Low

High, Medium, Low

High, Medium, Low

High, Medium, Low

Process Expert

OLR Demos Examples Process Expert

Fig. 52

File View Format Support Window Mode Exit

**Potential Analysis**

Opportunity Taking Promoting Action YES

Action Statement

Action Plan

Action	Notes	Who	When

Priority Potential *Promoting opp.* Actions Likely Cause *Promoting Action*

Insert Likely Cause Insert Promoting Action

OLR Demos Examples Process Expert

938

Fig. 53

File View Format Support Window Mode Exit

**Potential Analysis**

Opportunity Taking Capitalizing Action YES

Action Statement

Action Plan

Action	Notes	Who	When

Priority Potential *Capitalizing opp.* Actions Likely Cause *Capitalizing Action*

Insert Capitalizing Action Insert Promoting Action

OLR Demos Examples Process Expert

939 942 940 944

Fig. 54

[illegible]

946

Fig. 55

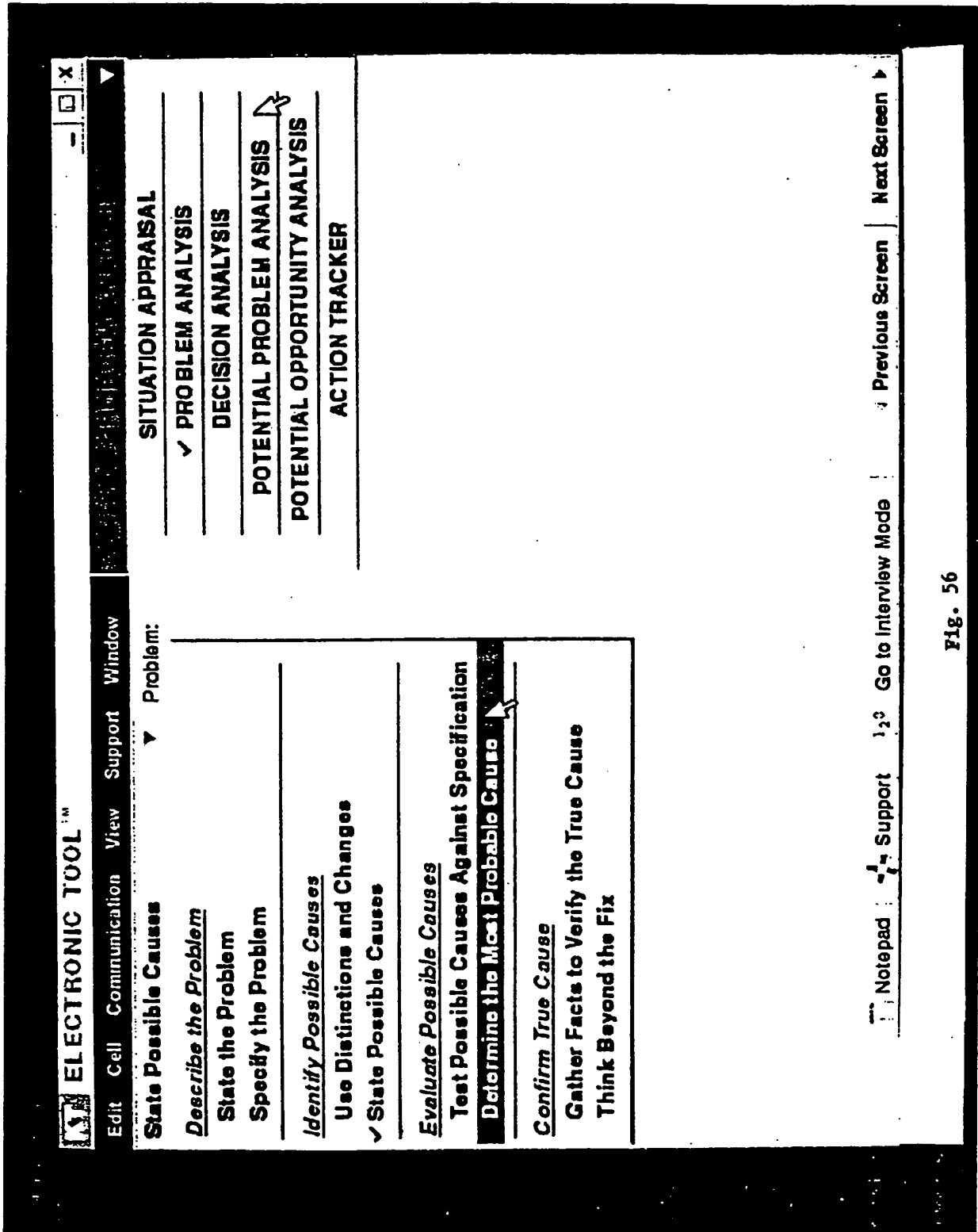


Fig. 56

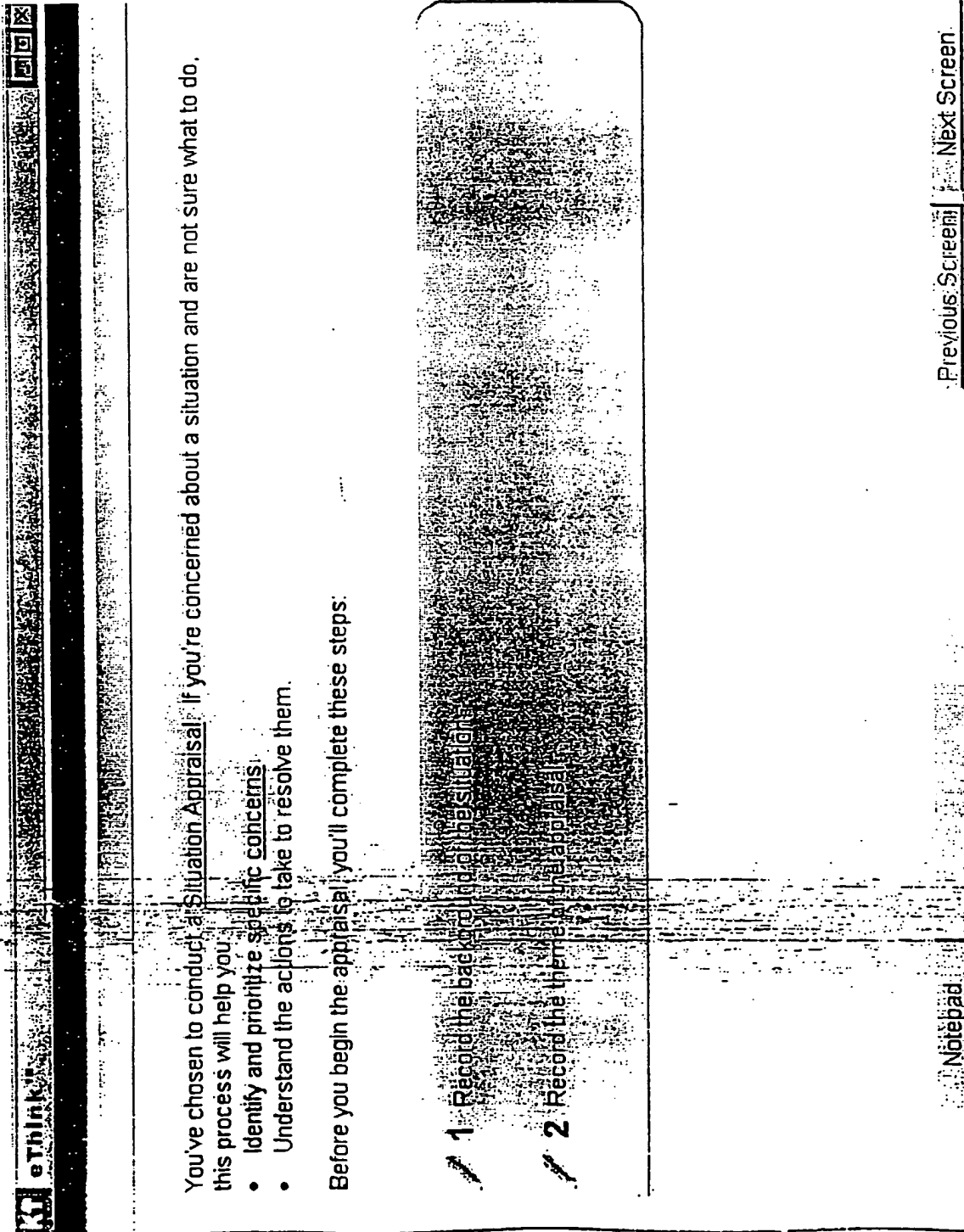


Fig. 57



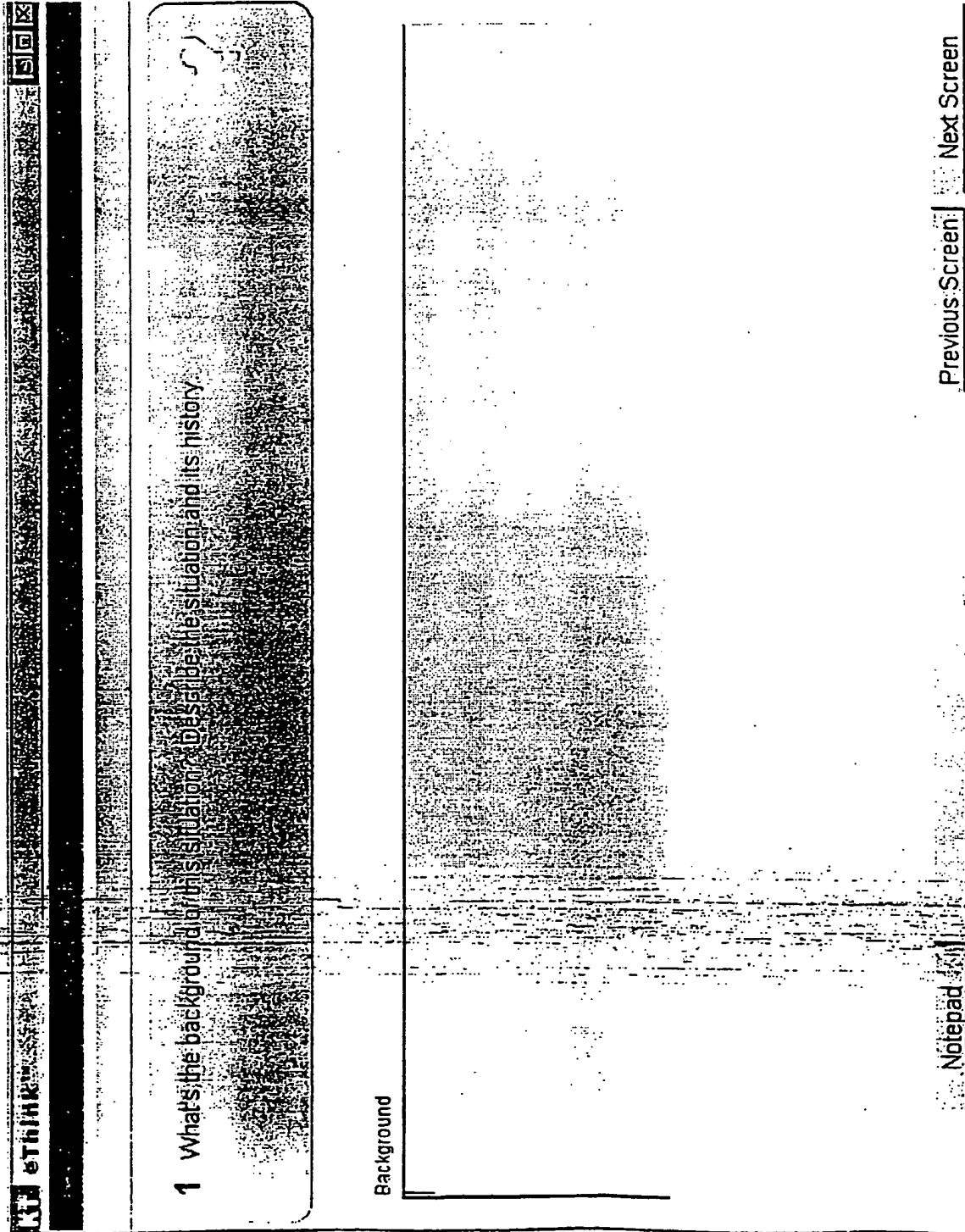


Fig. 58

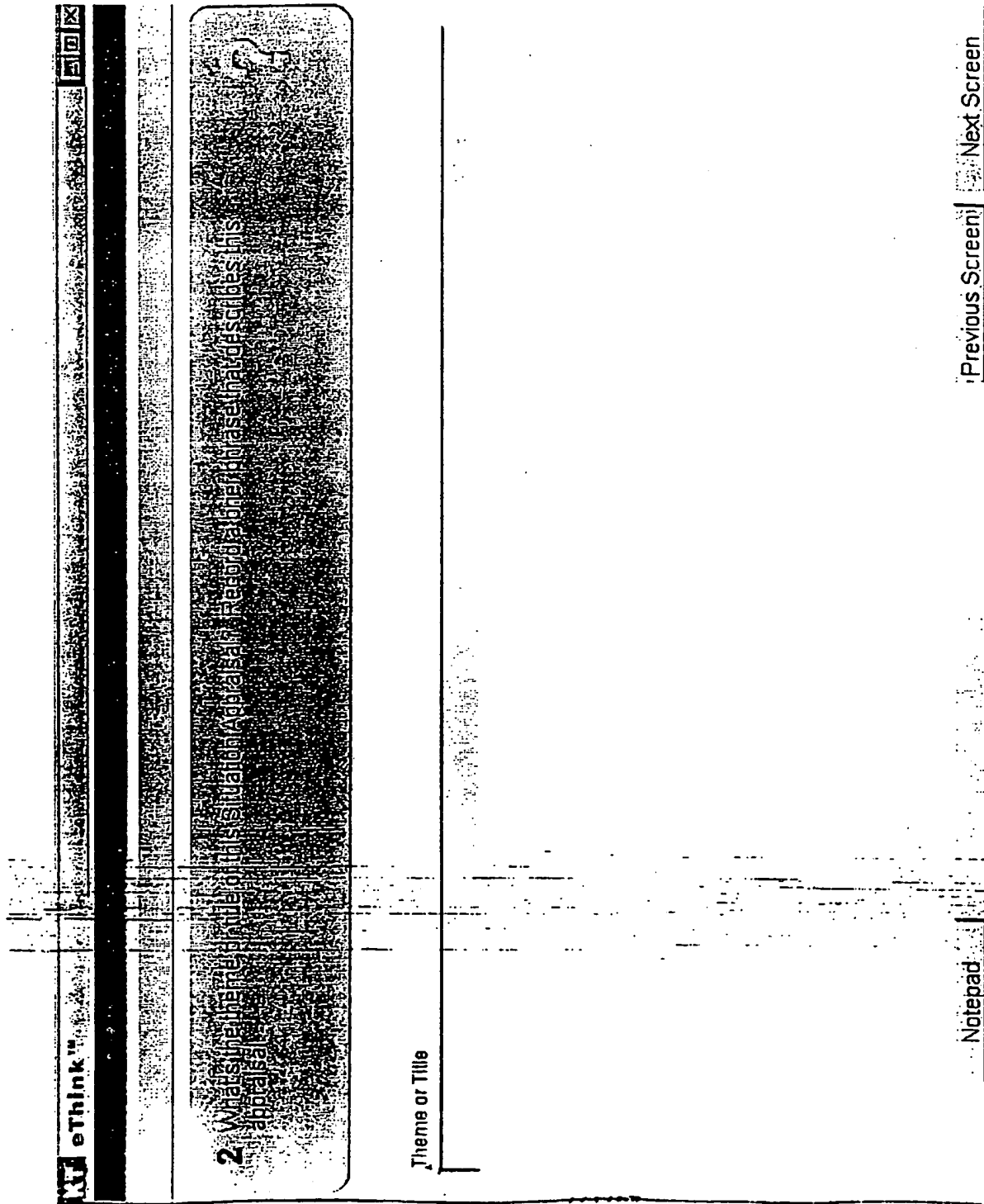


Fig. 59

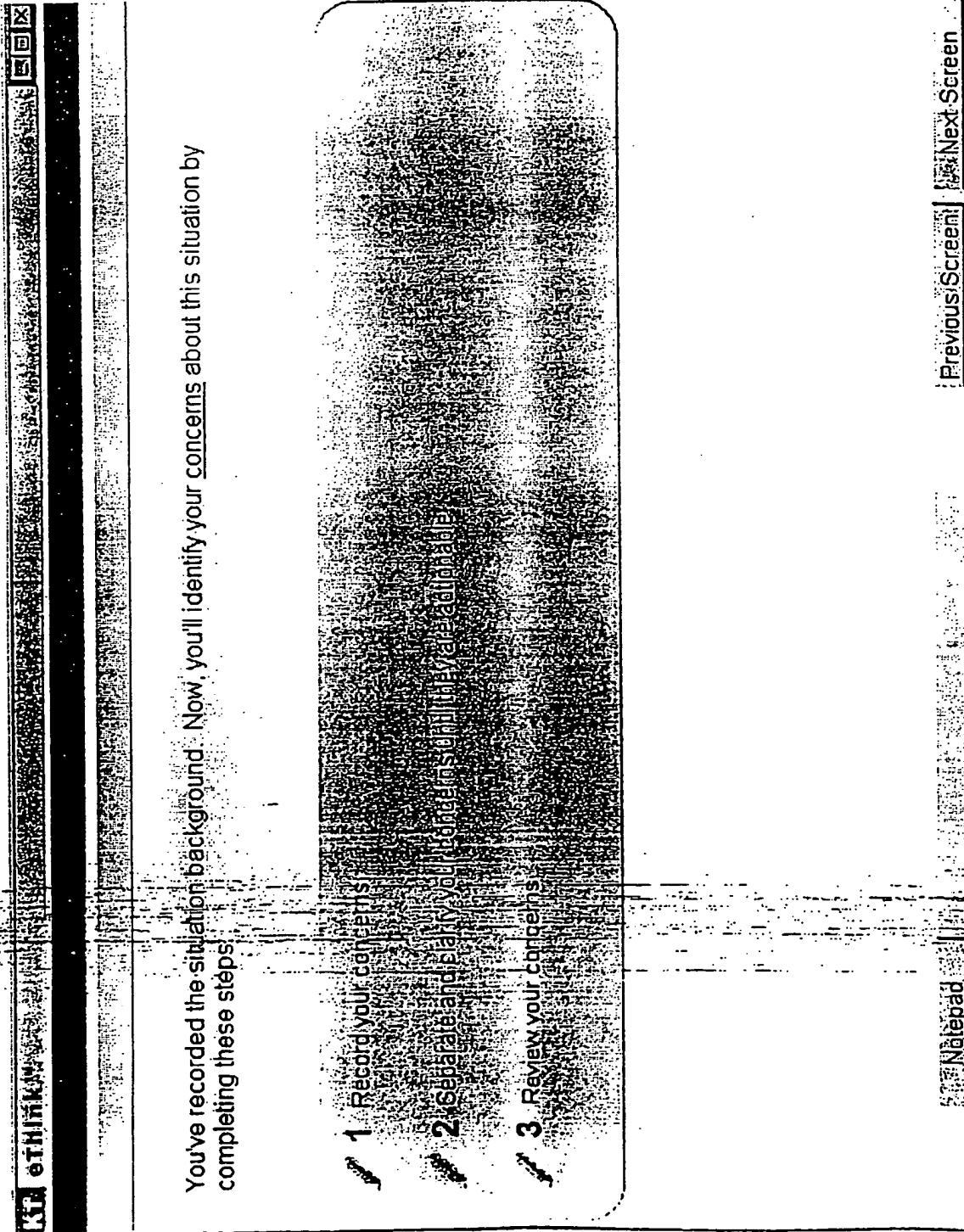


Fig. 60

KT

ethink

1

What are your concerns about this situation? Record a brief description of each issue or concern and an opportunity you're looking for.

Concerns


Insert New Concern

Next Screen

**Fig. 61**

<b>Think "X"</b>				
<b>2a</b>	What do you mean by concern? If separated and clarified your concern by rewriting has one or more statements in which reading and action needed are clear. The meaning and action required are already stated as clearly as possible.			
Separated and Clarified Concerns				
<table border="1"> <tr><td></td></tr> <tr><td></td></tr> <tr><td></td></tr> </table>				
Keep concern as is				
Insert New Concern				
<b>2b</b>	Review the next concern			
<table border="1"> <tr> <td>Previous Concern</td> <td>Next Concern</td> </tr> </table>		Previous Concern	Next Concern	
Previous Concern	Next Concern			
Notepad				
Previous Screen   Next Screen				

**Fig. 62**

Concerns		Separated and Clarified Concerns

Insert New Concern

**3 Review your separated and clarified concerns. Are any concerns still unclear? Do any of the concerns need further clarification or action to resolve them? If so, revise them now.**

Insert New Clarified Concern

**Fig. 63**

**eThink**

You've identified and clarified your concerns. In the next section, you'll set priority for resolving your concerns. Is the order in which the concerns need to be resolved clear?

☒ Yes, and I would like to set the priority now.

☐ No. I need to determine the Current Impact, Future Impact, and Time Frame of each concern before I can determine the priority.

Notepad Previous Screen Next Screen

Fig. 64

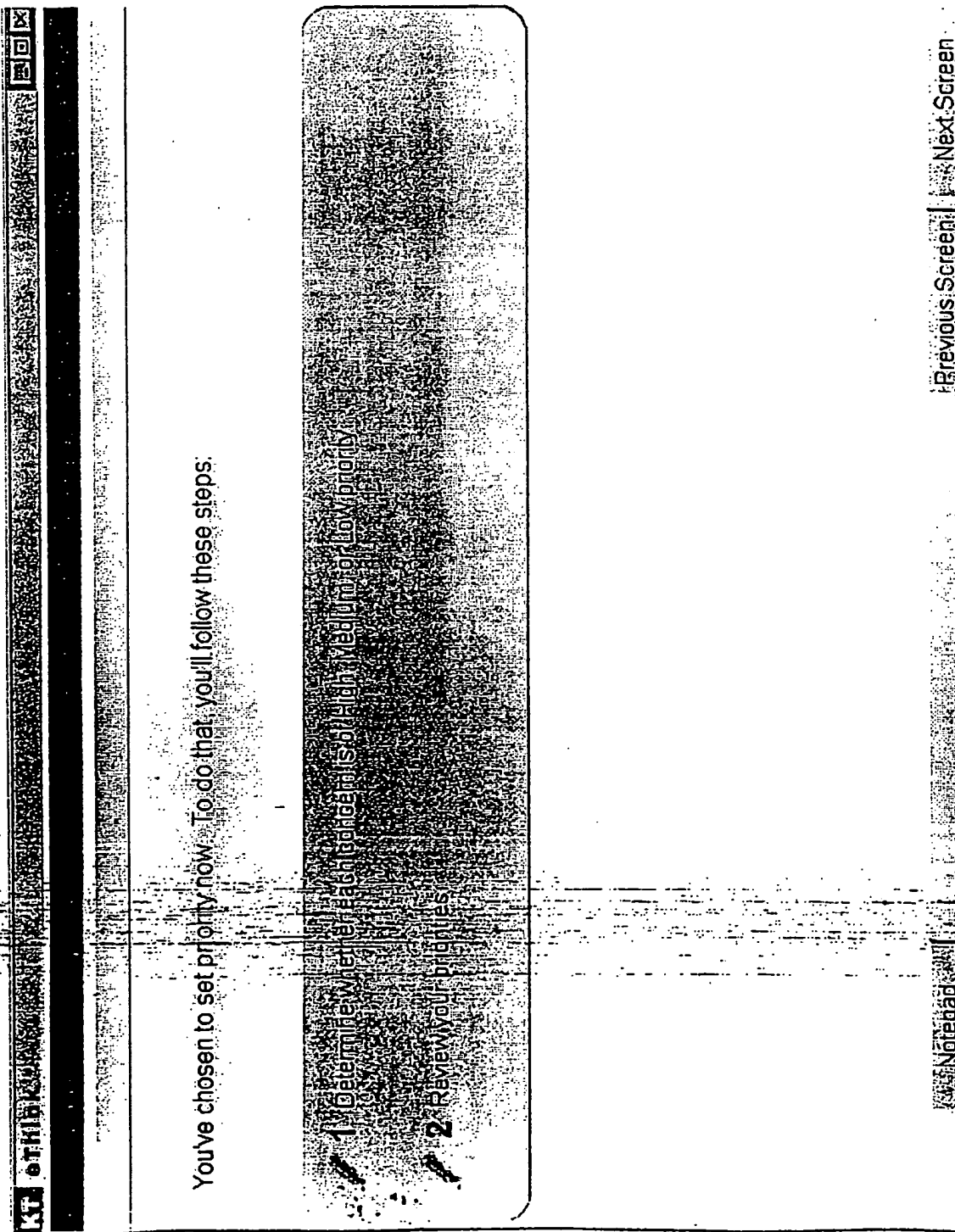


Fig. 65



1 What's the priority for resolving each concern? Prioritize your concerns as High, Medium or Low depending on their importance and the order in which you will resolve them.

Concerns	Priority
	High
	High
	High
	High
	High
	High

Notepad

Previous Screen

Next Screen

Fig. 66

Concerns		Priority
		High
		High
		High
		High
		High
		High

Previous Screen    Next Screen

**Fig. 67**

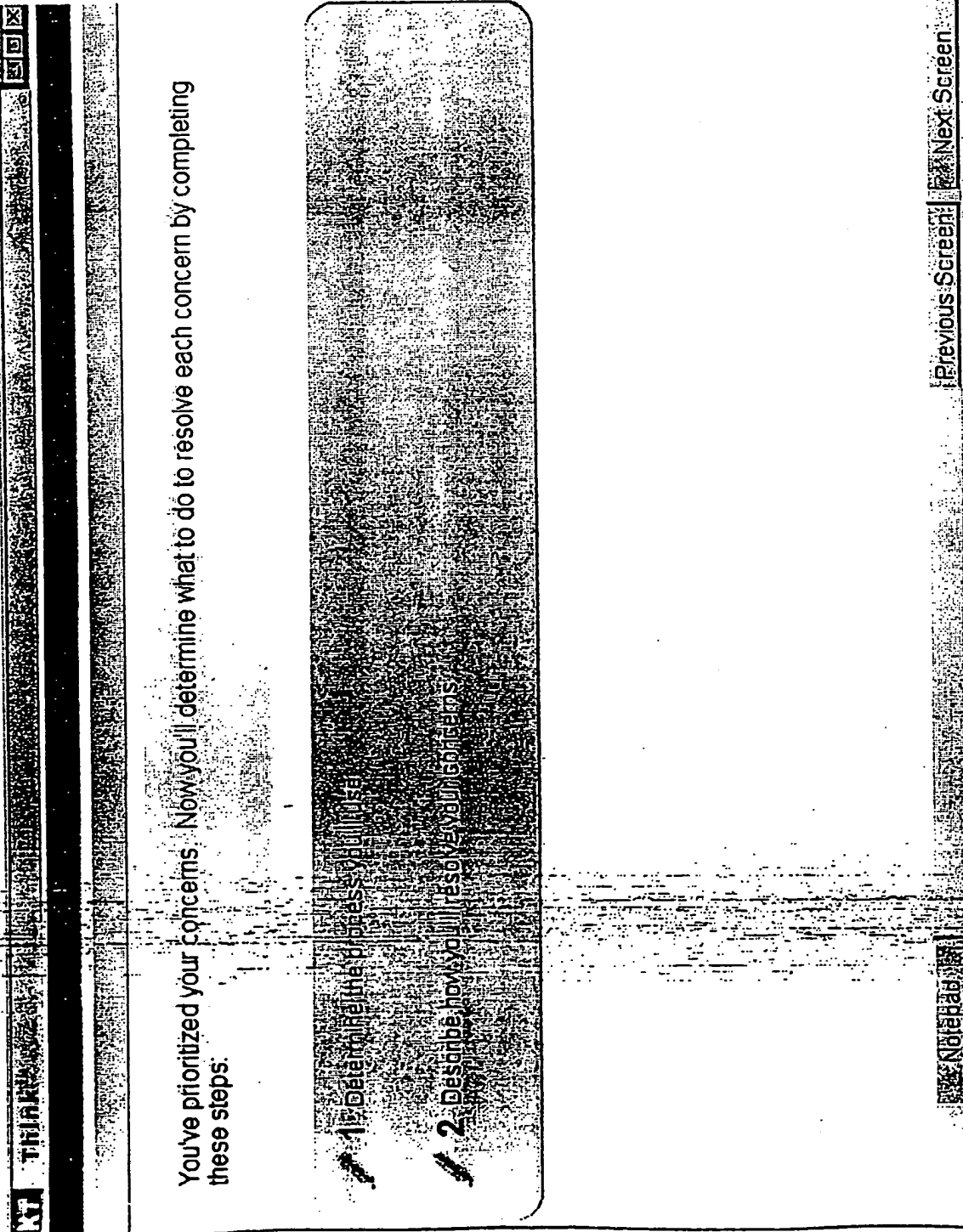


Fig. 68

Process	
	Situation Appraisal
	Situation Appraisal
	Situation Appraisal
	Situation Appraisal
	Situation Appraisal
	Situation Appraisal

**Concerns**

What process should you use to resolve concerns? Choose the most appropriate process from below.

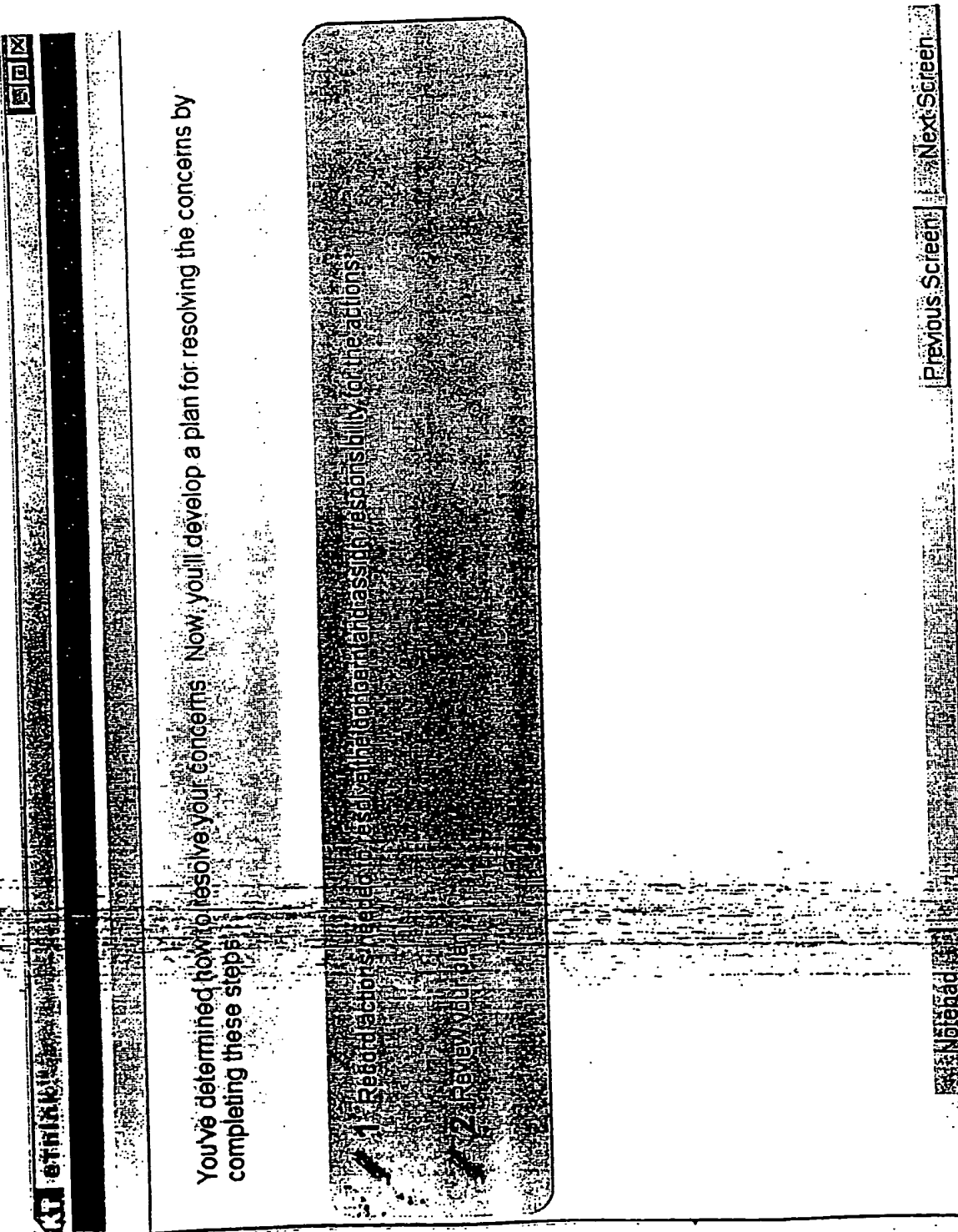
Call of War! Write a letter without any analysis or base knowledge!

Insert New Word Here

Notepad Previous Screen Next Screen

**Fig. 69**

**Fig. 70**



**Fig. 71**

Concerns	Priority	Process	Resolution	Actions	When	Who	Role
	High	<input checked="" type="checkbox"/> Situation Appraisal	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>
	High	<input checked="" type="checkbox"/> Situation Appraisal	<input checked="" type="checkbox"/>				
	High	<input checked="" type="checkbox"/> Situation Appraisal	<input checked="" type="checkbox"/>				
	High	<input checked="" type="checkbox"/> Situation Appraisal	<input checked="" type="checkbox"/>				

Insert New Action

---

**1b Assign actions for another concern**

[Previous Screen](#) | [Next Screen](#)

**Fig. 72**

Concerns	Priority	Process	Resolution	Actions	When	Who	Role
	High <input checked="" type="checkbox"/>	Situation Appraisal	<input checked="" type="checkbox"/>				
	High <input checked="" type="checkbox"/>	Situation Appraisal	<input checked="" type="checkbox"/>				
	High <input checked="" type="checkbox"/>	Situation Appraisal	<input checked="" type="checkbox"/>				
	High <input checked="" type="checkbox"/>	Situation Appraisal	<input checked="" type="checkbox"/>				
	High <input checked="" type="checkbox"/>	Situation Appraisal	<input checked="" type="checkbox"/>				
	High <input checked="" type="checkbox"/>	Situation Appraisal	<input checked="" type="checkbox"/>				

Use NEW Action

**Fig. 73**



**ELECTRONIC TOOL™**

Edit Cell Communication View Support Window

**Use Distinctions and Changes** | Problem: Flight attendants have red sweat

	Is	Is Not	Distinctions	Changes
What object?	Flight attendants	Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants	Demonstrate safety equipment	New life vests (early January)
	Both male and female	Only female Only male		
What Deviation?	Red sweat	Blisters, sores		
	Perspiration with red particles	Blood		
Where Geographically?	On our A300s	Other carriers using A300s Our DC-9s	Our A300 interior configuration	New counter tops (early March) New cleanser (mid March) new safety equipment (early January) new life vests (early January) No known change
	Three 727s	Other Eastern 727s	different flotation devices	
	NY-Florida (A300) NY-Chicago (727) NY-Toronto (727)	Our other A300 routes Our other 727	Flights over water	

Insert Is/Is Not Pair      Insert Distinction      Insert Change

Notepad      Support      ?      Go to Interview Mode      Previous Screen      Next Screen

Fig. 74

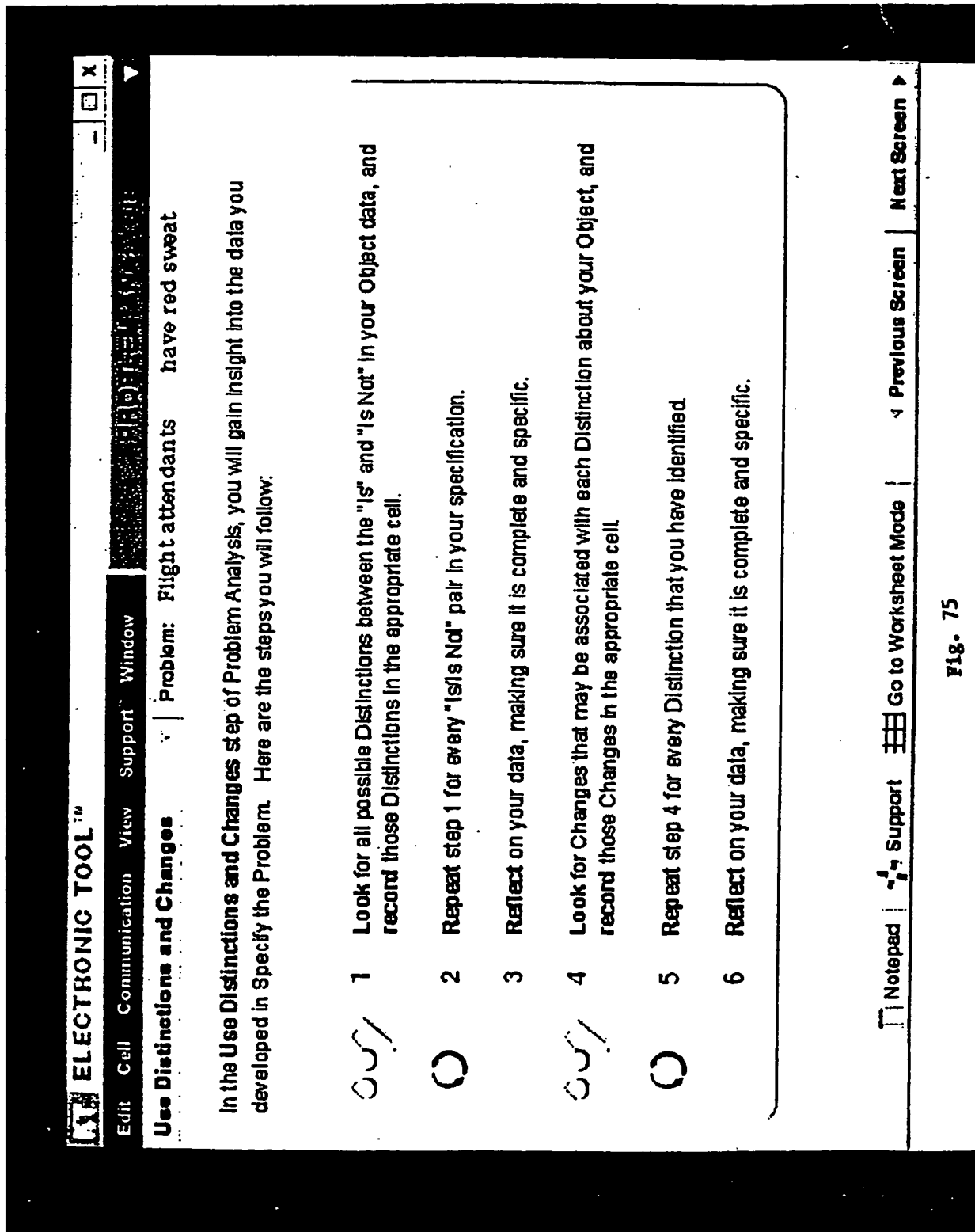


Fig. 75

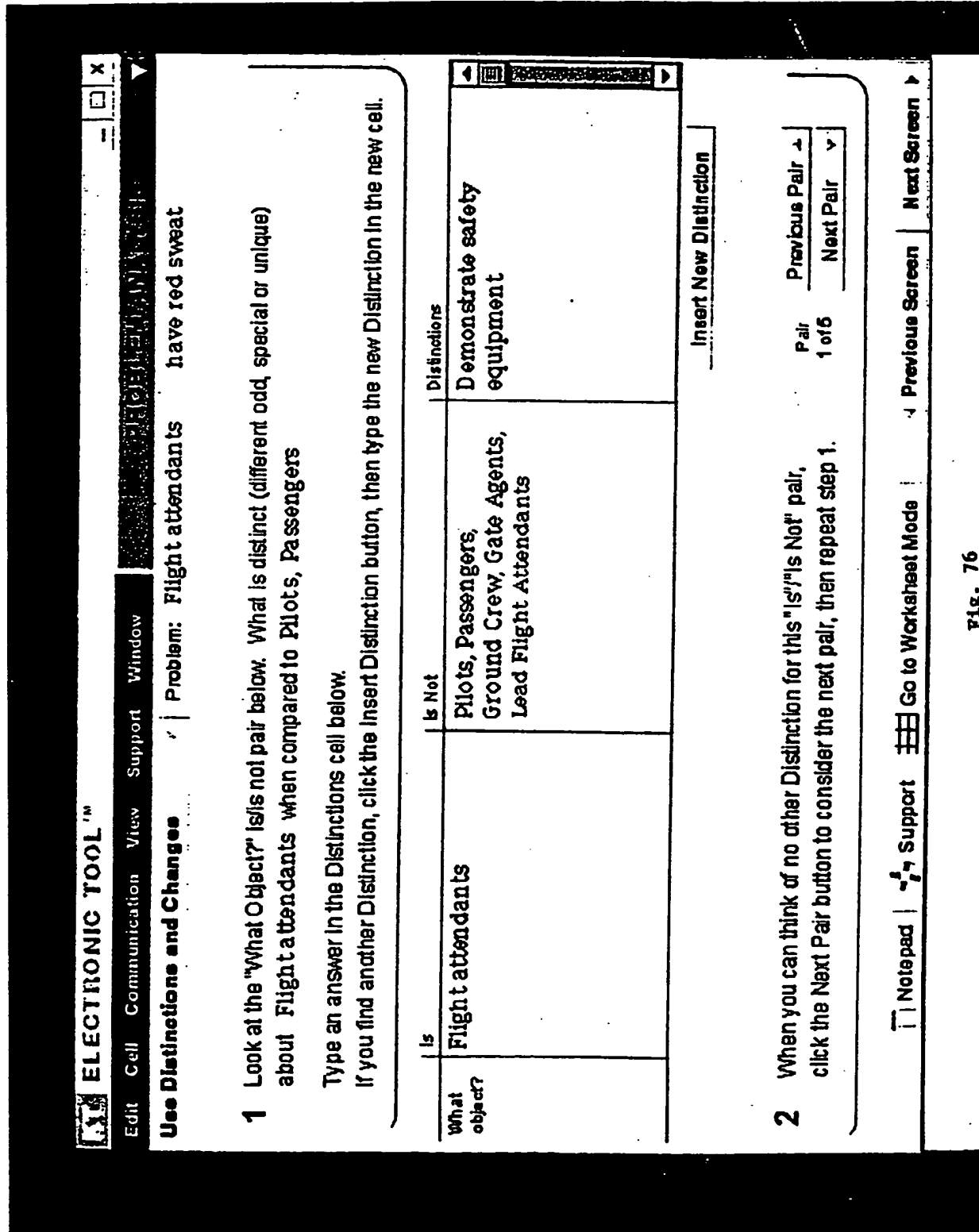


Fig. 76

**ELECTRONIC TOOL™**

Edit Call Communication View Support Window

**Use Distinctions and Changes** | Problem: Flight attendants have red sweat

3 Here are all the Distinctions you recorded. Review your data now and make any additions or corrections.

	Is	Is Not	Distinctions
What object?	Flight attendants	Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants	Demonstrate safety equipment Touch lifevests Touch oxygen masks Handle sample belts
	Both male and female	Only female Only male	
What deviation?	Red sweat Perspiration with red particles	Blisters, sores Blood	
Where geographically?	On our A300s	Other carriers using A300s Our DC-9s	Our A300 interior configuration

Insert New Distinction

Notepad | Support | Go to Worksheet Mode | Previous Screen | Next Screen

Fig. 77

ELECTRONIC TOOL™			
Edit	Cell	Communication	View Support Window
<b>State Possible Causes</b>		▼	Problem: Flight attendants have red sweat
<p><b>1</b> How could new life vests (early January)</p> <p>Cause: Red sweat</p> <p>In, around, or between: Flight attendants</p> <p>Type your answer in the Possible Cause area below. If you find more than one Possible Cause for this Change, click the Insert Cause button, then type the new Possible Cause in the new cell.</p>			
<div> <div>Possible Causes</div> <div> Dye rubs off on flight attendants Allergic reaction by flight attendants </div> </div>			
		Insert New Cause	
<p><b>2</b> When you can think of no other Possible Causes for this Change, click the Next Change button to consider the next Change from those you listed previously.</p>		Change 1 of 3	Previous Change ▲ Next Change ▼
Notepad		Support	Go to Worksheet Mode Previous Screen Next Screen

**ELECTRONIC TOOL™**

Edit Cell Communication View Support Window

**Test Possible Causes Against Spec.** Problem: Flight attendants have red sweat

Select a cause to test: Ink from the printed letters causing allergic reactions in some attendants

What object?	Is	Is Not	Conditions	Assumptions or Reasons
Flight attendants		Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants	only if...	the flight attendants are the only ones touching life vests
Both male and female		Only female Only male	yes, because...	men and women can have allergies
Red sweat		Blisters, sores	no, because...	allergies cause rash & blisters, not sweat
Perspiration with red particles		Blood	no, because...	allergies cause rash & blisters, not sweat
On our A300s		Other carriers using A300s Our DC-9s	yes, because...	only our A300s use vests with printing
Three 727s		Other Eastern 727s	yes, because...	only those 727s use vests with printing
NY-Florida (A300)		Our other A300	yes, because...	only these routes use

Insert Reason or Assumption

Notepad Support 1,2 Go to Interview Mode Previous Screen Next Screen

Fig. 79

**ELECTRONIC TOOL™**

Edit Cell Communication View Support Window

**Test Possible Causes Against Spec.** | Problem: Flight attendants have red sweat

**3 Select a Cause**

1 Which cause would you like to test? Select a cause to test from the list below.

Cause	Status
Ink from the canvas causing allergic reactions in some attendants	Not started
Ink from the printed letters causing allergic reactions in some attendants	In progress
Flakes of ink rubbing off on attendants' skin, mixing with perspiration	

2 In the next step, you'll test this cause against each pair of Is/Is Not statements in the spec.  
The object of this step is to try to think of every reason why this statement *might not be* the cause of:  
Flight attendants have red sweat  
To do this, you'll list facts and assumptions about your cause that make the cause difficult or impossible to accept.

**4**

**5** click Select Cause to test a different cause.

**Test Cause**

Select Cause

Notepad Support Go to Worksheet Mode Previous Screen Next Screen

Fig. 80

**ELECTRONIC TOOL™**

Edit Cell Communication View Support Window

**Test Possible Causes Against Spec.** Problem: Flight attendants have red sweat

**3** If Ink from the printed letters causing allergic reactions in some attendants is the true cause of Flight attendants have red sweat

Does it explain:  
Flight attendants

But not:  
Pilots  
Passengers  
Ground Crew

**Conditions**

☐ yes it does, because...  
☐ no it does not, because...  
☒ it does, but only if you assume...

**Assumptions or Reasons**

the flight attendants are the only ones touching life vests

**Insert Assumption or Reason**

**4** To test this cause against the next Is/Is Not pair, click Next Pair.

Pair 2 of 4

Previous Pair  
Next Pair

**5** If you've tested all the Is/Is Not pairs, or if you've rejected this cause, click Select Cause to test a different cause.

Select Cause

Notepad Support Go to Worksheet Mode Previous Screen Next Screen

Fig. 81



**Fig. 82**

**ELECTRONIC TOOL™**

Edit Cell Communication View Support Window

Action Files: Red Sweat PA

Priority	Concern	Seriousness	Urgency	Growth	Process
Medium	Confirm true cause	Low	High	Stable	PA
Low	PA on dropping revenues	Medium	Low	Increasing	PA

Sort By Priority

Action	Who	When	Notes	Status
Perform chemical analysis on cleaning fluid	J. Schlick	11-18-98	Fluid product # 144	Cause Confirmed
Check paint on all new life vests.	J. Schlick	12-15-98		Completed

Sort By When View My Actions Only

Notepad Support

Send/Receive Action

Fig. 83

**ELECTRONIC TOOL™**

Edit Cell Communication View Support Window

**Use Distinctions and Changes** | Problem: Flight attendants have red sweat

**1** Look at the "What Object?" Is/Is not pair below. What is distinct (different odd, special or unique) about Flight attendants when compared to Pilots, Passengers

Type an answer in the Distinctions cell below.

If you find another Distinction, click the Insert Distinction button, in the new cell.

What Object?	Is	Is Not	Distinctions
Flight attendants (The full text and intent of this question is displayed within this mouse-over.)		Pilots, Passengers, Ground Crew, Gate Agents, Lead Flight Attendants	Demonstrate safety equipment

Insert New Distinction

**2** When you can think of no other Distinction for this "Is"/"Is Not" pair, click the Next Pair button to consider the next pair, then repeat step 1.

Pair 1 of 5 Previous Pair Next Pair

Notepad Support Go to Worksheet Mode Previous Screen Next Screen

Fig. 84

**Let's eThink™**

You've chosen to conduct a Problem Analysis. If you have a problem, and you don't know what's causing it, Problem Analysis will help you find the cause.

Before you begin the analysis, record the problem background by completing these steps:

- / 1 Describe how the object with the problem is actually performing and how it should be performing
- / 2 Write a concise Problem Statement that explains what object has the problem and what the problem is
- / 3 Confirm that the cause of the problem is unknown
- / 4 Describe how the problem was discovered
- / 5 Record the actions to minimize the problem and any attempts to solve it.
- / 6 Review the problem background

Notepad Previous Screen Next Screen

Fig. 85

<p>KT Think</p>																													
<p><b>1a</b> How is the person's process for handling the problem actually performed?</p>																													
<p>Actual:</p>																													
<p><b>1b</b> How should the person's process for dealing with the problem ideally be performed?</p>																													
<p>Should:</p>																													
<p>File Notebook</p>															<p>File of Screens Next Screen</p>														

Fig. 86

<b>KT</b> ThinkPad	
<p>Refer to your <u>Should</u> and <u>Actual</u> information to answer the following questions.</p> <p>Should:</p> <p>Actual:</p>	<p><b>2a</b> What equipment, system, condition, process, or person has the problem? Briefly describe the object that has the problem.</p>
<p><b>Object</b></p>	<p><b>2b</b> What's the difference between what should be happening and what is actually happening? Briefly describe the deviation the object is experiencing.</p>
<p><b>Deviation:</b></p>	<p>Your Problem Statement describes the object and the deviation. If necessary, edit the statement so that it can be easily understood by anyone in your organization.</p>
<p><b>Problem Statement</b></p>	<p>Previous Screen   Next Screen</p>

Fig. 87

Notepad

3 Do you know what's causing this?

☐ No, I'm not certain. Continue the PA  
☐ Yes, but I need to choose a way to fix it  
☐ Yes, but I need to make a plan for fixing it  
☐ Yes, but I can't fix it until I find out what's causing the cause  
☐ Yes, but I want to continue this PA anyway

Previous Screen Next Screen

Fig. 88



Fig. 89



[illegible]

**Fig. 90**

[illegible]

**Fig. 91**

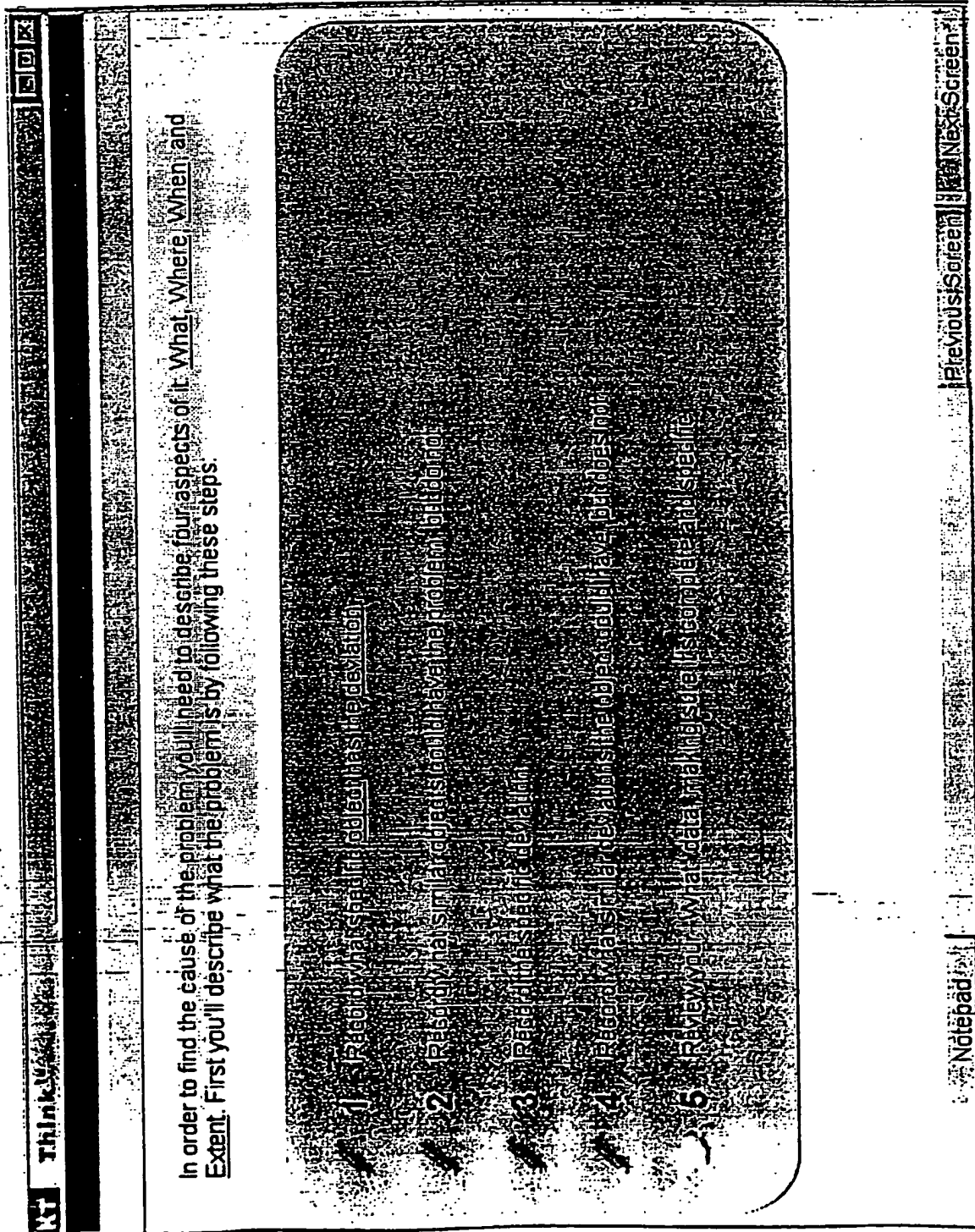


Fig. 92

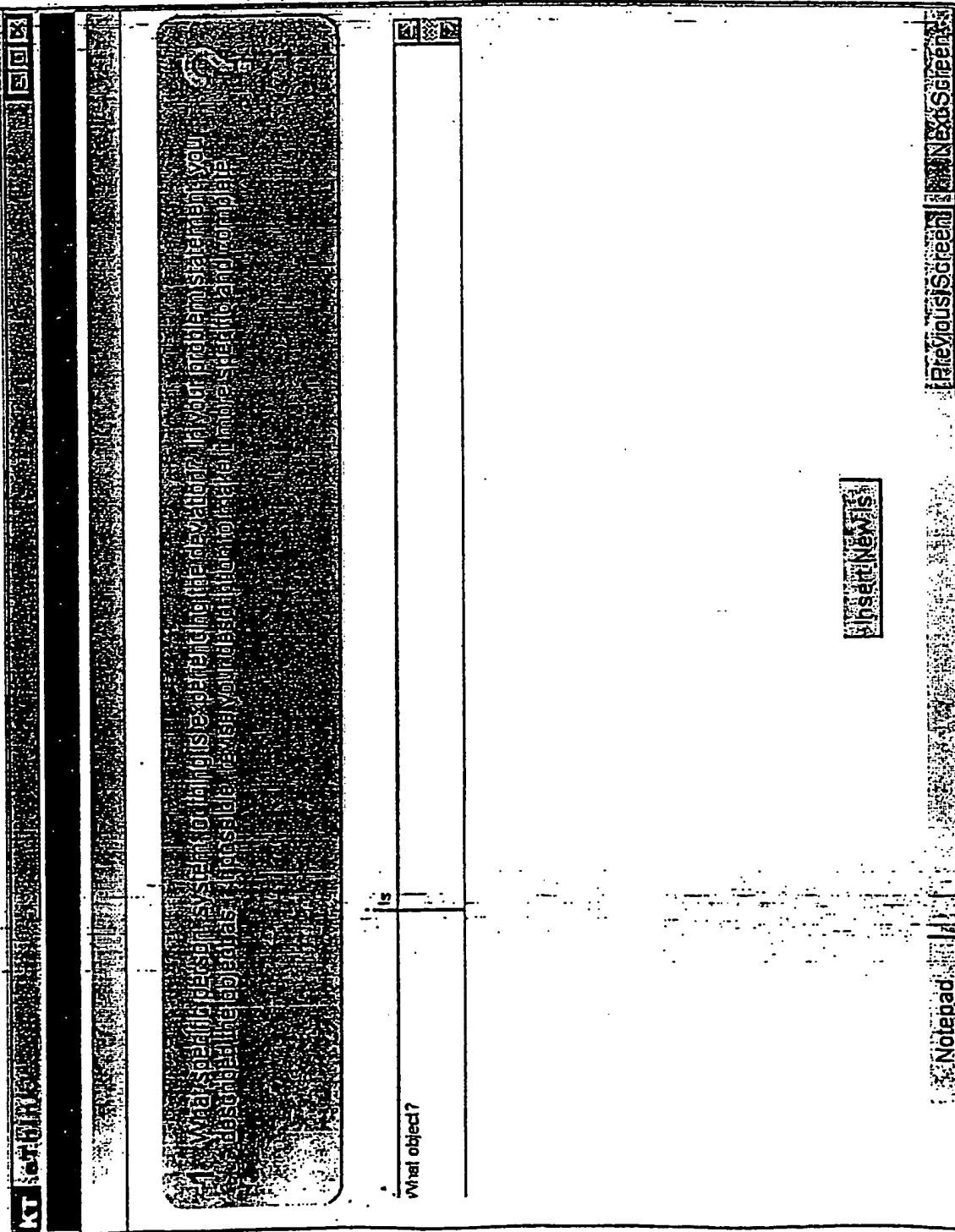


Fig. 93

<p>KT eThink</p>	
<p>2. What can a system do that a human could do? Have a human's natural/learned nature?</p>	
<p>What object?</p>	<p>Is Not</p>
<p>Insert New Is/Is Not Pair</p>	
<p>Previous Screen Next Screen</p>	

Fig. 94

<p>KT</p>	<p>What deviation?</p>	<p>What deviation?</p>	<p>What deviation?</p>	<p>What deviation?</p>
-----------	------------------------	------------------------	------------------------	------------------------

Fig. 95

**P18. 96**

KT

5

REVIEW YOUR WHAT DO YOU WANT TO OBTAIN FROM THE IMPROVEMENT? Do you need to add more? If so, revise your plan.

	Is	Is Not
What object?		
What deviation?		

Insert New Is/Is Not Pair

Previous Screen

Next Screen

Notebook

**Plg. 97**



**KT eThink**

You've described what the problem is. Now, you'll describe where the problem is located by completing these steps:

1. Record the physical location where the object is observed when it has the deviation.
2. Record other physical locations where the object has been when it did not have the deviation.
3. Record where the deviation is on the object.
4. Record locations on the object where the deviation could be, but is not.
5. Review your where data making sure it's complete and accurate.

**Notes**

Previous Subject: Next Subject

Fig. 98

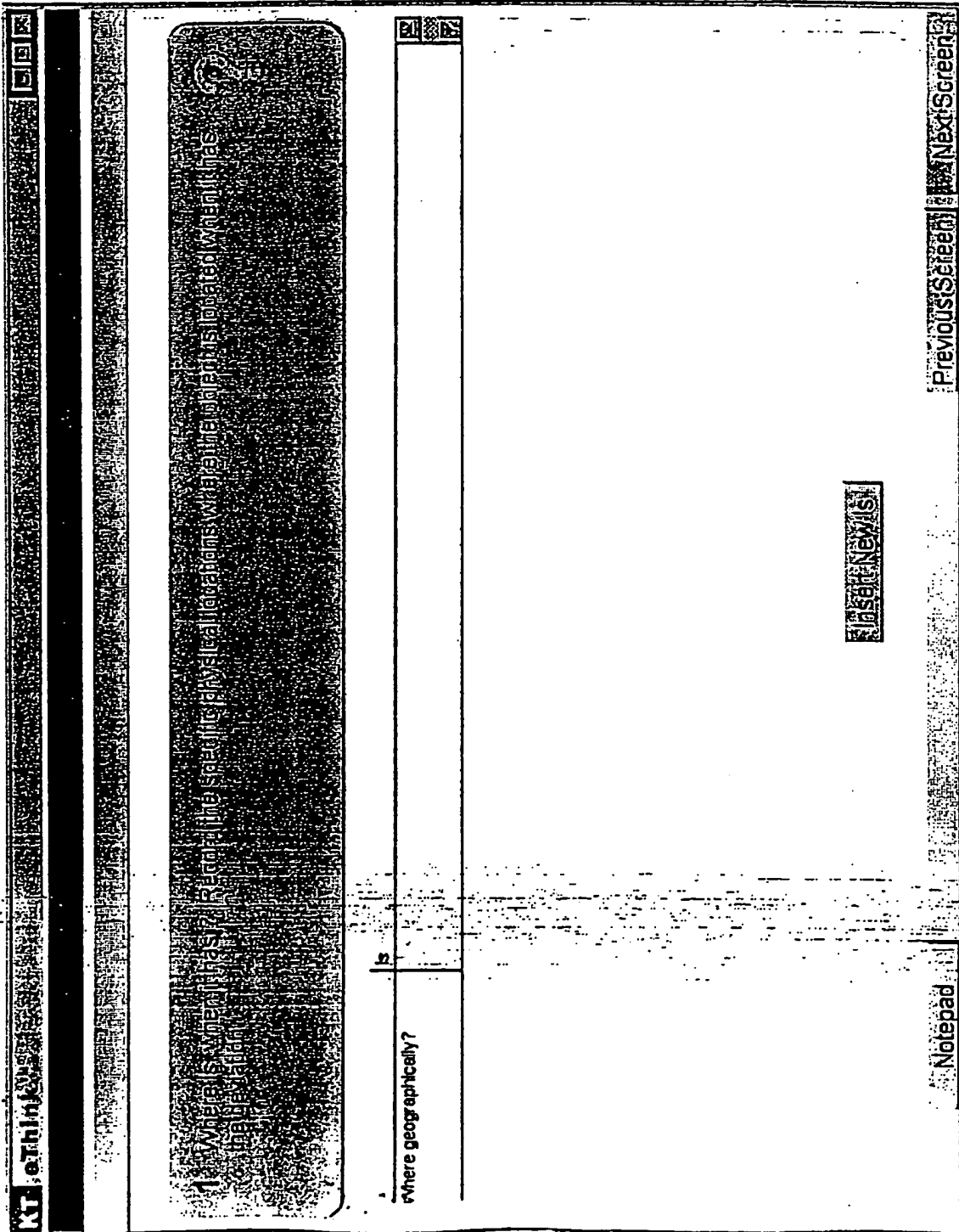


Fig. 99

<div> <div>KT Think</div> <div> <div>2. What has been located? Record the plates of identified objects have been located. Have they been located? When they did not have the deviation.</div> </div> </div>	
Where geographically?	Is Not
<div> <div>Insert New Wis/Is Not Pair</div> <div> <div>Notepad</div> <div>Previous Screen</div> <div>Next Screen</div> </div> </div>	

Fig. 100

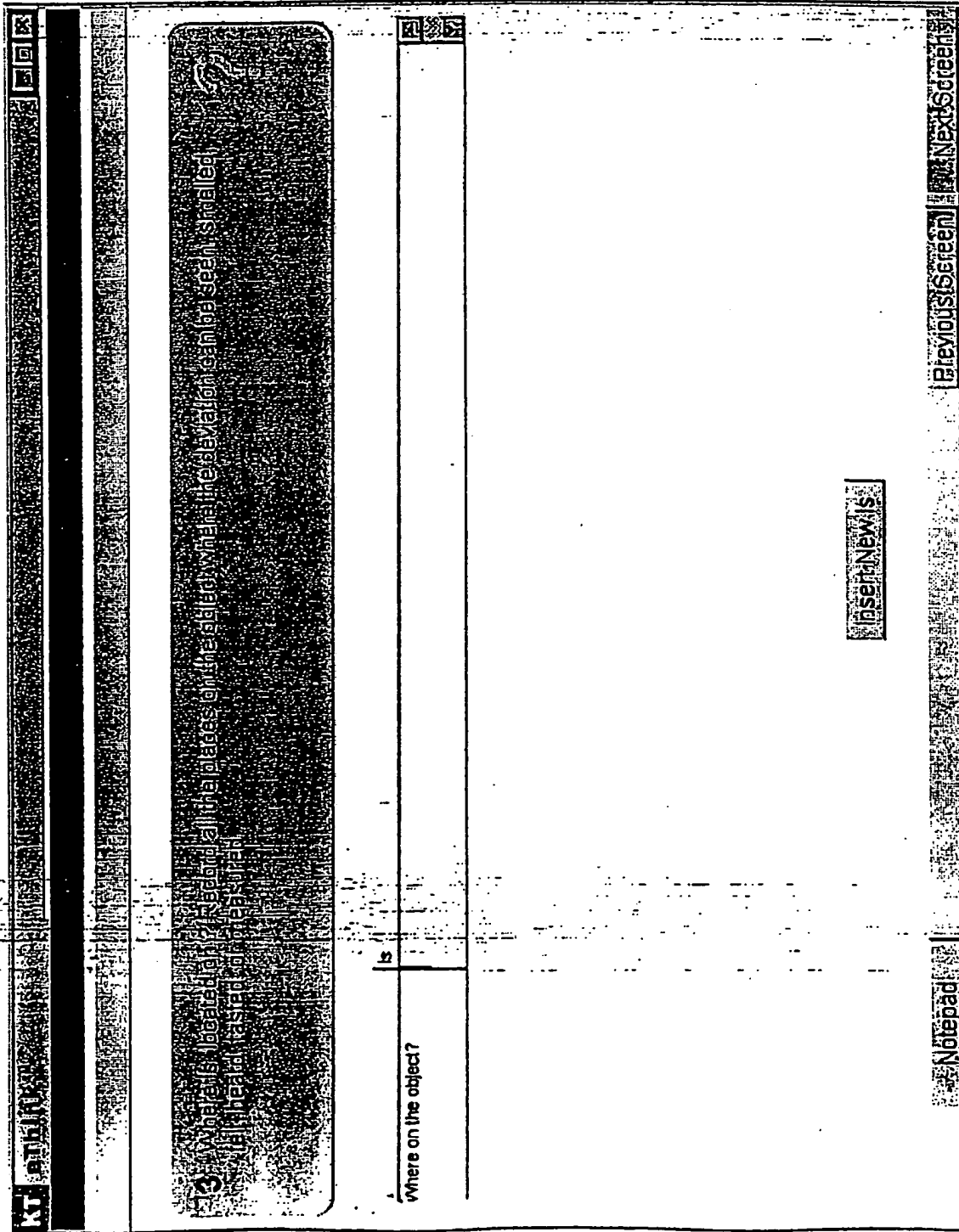


Fig. 101

<p>ethink</p>	
<p>4. Where does the object located on the screen? Record places on the object where you could reasonably expect to see the object, but do not</p>	
<p>Where on the object?</p>	<p>Is Not</p>
<p>Insert New Is/Is Not Pair</p>	
<p>Notepad</p>	<p>Previous Screen Next Screen</p>

Fig. 102

	Is	Is Not
Where geographically?		
Where on the object?		

**5** Review your video information (can you make your data more specific? Do you need to identify what it is so revise your data now.

Insert NEW IS/IS NOT RAJ

Previous Screen Next Screen

**Fig. 103**

**etthink™** [Previous Screen] [Next Screen]

You just described the location of the object. Now, describe when the problem occurred by following these steps:

- 1 Record when the problem was first noticed
- 2 Record the times when the problem could have been noticed first, but was not
- 3 Record the times the problem has occurred since the first time it happened
- 4 Record the times after the first regular cycle when the problem could have happened, but did not
- 5 Record the next time the object's life cycle that was happening when the problem first occurred
- 6 Record the times in the object's life cycle that could have been happening when the problem first occurred
- 7 Review your When data

**NotePad** [Previous Screen] [Next Screen]

Fig. 104

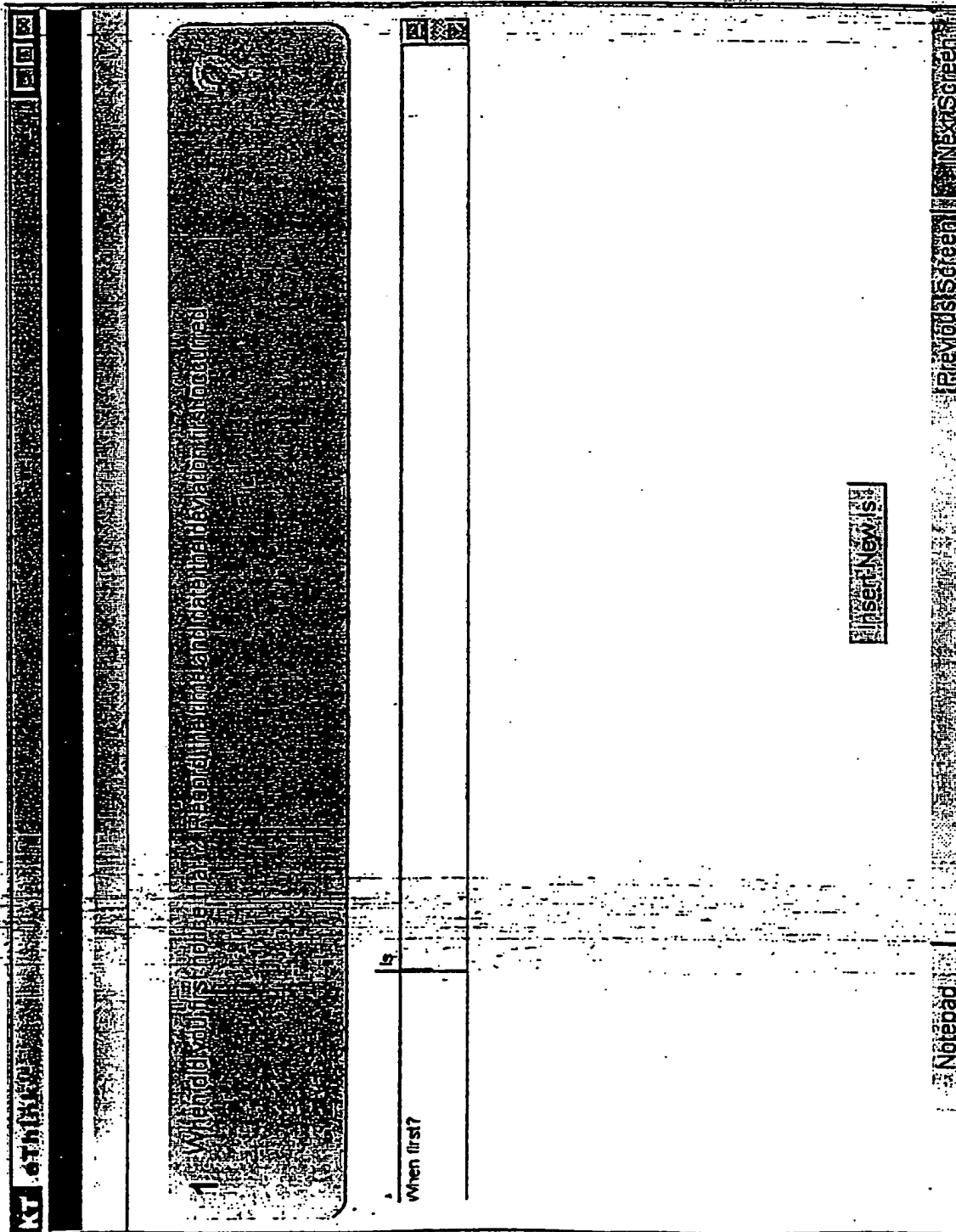


Fig. 105



ethink™

2. What times of day could you have your notes and dates and times when the problem could have been solved first?

Is

Is Not

When first?

Previous Screen

Next Screen

**Fig. 106**

<p><b>3a</b> Has the issue been reported? If so, and the dates provided, is the deviation observed after the first trial?</p> <p>Always followed</p>		<p>Is</p>	<p>When since?</p>
<p><b>3b</b> Has the issue been reported? Determine whether the deviation happens continuously, periodically, or sporadically. Select the category that best fits.</p>		<p>Is</p>	<p>What pattern?</p>
<p>Continuously</p>		<p>Is</p>	<p>What pattern?</p>

**Fig. 107**

<p><b>4b</b> What since could have passed read, but it didn't? Record the dates and times after when you might have expected to see the problem (all of them).</p>	
When since?	Is Not
<p>You said the deviation is occurring in a pattern. Based on this information, the system has selected what patterns that could be associated with the data. If needed, you may revise the data.</p>	
What pattern?	Is Not
Patterns	Continuously
<p>Notepad Previous Screen Next Screen</p>	

Fig. 108

<p>KT (c) 1999/10/10</p>	<p>5. What was happening when the first observable event (stage, operation, or speed) in the tablet's life cycle was happening when you first noticed the deviation?</p>	<p>is</p> <p>When in the life cycle?</p>	<p>Insert News</p>	<p>Notepad</p> <p>Previous Screen</p> <p>Next Screen</p>
--------------------------	--	--	--------------------	--

Fig. 109

	Is	Is Not
When in the life cycle?	<input type="checkbox"/>	<input type="checkbox"/>

What could have been prevented? Discharge hearings starts  
functions or stages of objects lifecycle during which violation has occurred to first police officer  
deviations did

Case News

Previous Screen    Next Screen

**Fig. 110**



**oThink™**

You described when the problem occurred. Now, you'll describe the extent of the problem by completing these steps:

- 1 Record the number of objects that have the deviation.
- 2 Record the number of objects that could have the deviation but do not.
- 3 Record the size of the deviation.
- 4 Record what the size of the deviation could be, but is not.
- 5 Record how many deviations are on a single object.
- 6 Record how many deviations could be on a single object, but are not.
- 7 Review your Extent Data.

Notepad Previous Screen Next Screen

Fig. 112

<p>KT eThinking</p>	
<p>1a How many have? Enter the total number, the percentage, or both.</p>	
How many objects?	Is
<p>1b Is the number of with increasing, decreasing, or staying the same? Select the one that best describes the trend.</p>	
What is the trend in number of objects?	Is
	Increasing
<p>Previous Screen Next Screen</p>	

Fig. 113



<p><b>KT oThnk</b></p>		<p><b>Previous Screen</b> <b>Next Screen</b></p>	
<p><b>2a</b> What could the bar number not with be, but is not. Patched the numbers or percentages more or less than that could be a total number of objects with the deviation.</p>			
<p>How many objects?</p>	<p>Is</p>	<p>Is Not</p>	<p>Notepad</p>
<p><b>2b</b> You said the number of with the deviation is. Based on this information the system stated trends that could be a total number of objects with the deviation. If necessary, revise the data.</p>			
<p>What is the trend in number of objects?</p>	<p>Is</p>	<p>Is Not</p>	<p>Previous Screen</p>

Fig. 114

<p><b>3a</b> What is the size of the trend? Record the size of range or sizes.</p>	
What size?	<p>is</p>
<p><b>3b</b> Is the size of the trend increasing or decreasing or staying the same? Select the one that best describes the trend.</p>	
What is the trend in the size?	<p>is</p> <p>Increasing</p>
Notepad	<p>Previous Screen</p> <p>Next Screen</p>

Fig. 115

<p><b>4a</b> What is the size of the deviation? Record the size of range of sizes in parentheses.</p>	
What size?	Is Not
<p><b>4b</b> You said the size of the deviation is based on this information. The system selected trends that do not describe the change. If the size of the deviation is necessary, revise the data.</p>	
What is the trend in the size?	Is Not
Increasing	7

**Fig. 116**

[illegible]

**Fig. 117**

KT		Is Not	
<p>6a) What would be the total number of catches, but is not in error the number of deviations more or less than that you would see, but only?</p>			
How many deviations?	Is	Is Not	
<p>6b) You said the number per Is. Based on this information the system selected trends that do not describe the change in the number of deviations on each object. In essence, revise the data.</p>			
What is the trend in deviations?	Is	Is Not	
	Increasing		
Is Not		Next Screen	

Fig. 118

**7**  
REVIEW YOUR ESSENTIAL DATA

Can you make your data more specific? Does any data need to be added? If so, revise it here.

	Is	Is Not
When in the life cycle?		
How many objects?		
What is the trend in number of objects?		
What size?		
What is the trend in the size?		
How many deviations?		

REVIEW YOUR ESSENTIAL DATA

REVIEW SCREEN

REVIEW SCREEN

FIG. 119

**Review your problem solution. Does it accurately describe what you know about the problem?**

**Does anything need to be added or changed? If so, revise your data now.**

	Is	Is Not
What object?		
What deviation?		
Where geographically?		
Where on the object?		
When first?		
When since?		
What pattern?		

Fig. 120

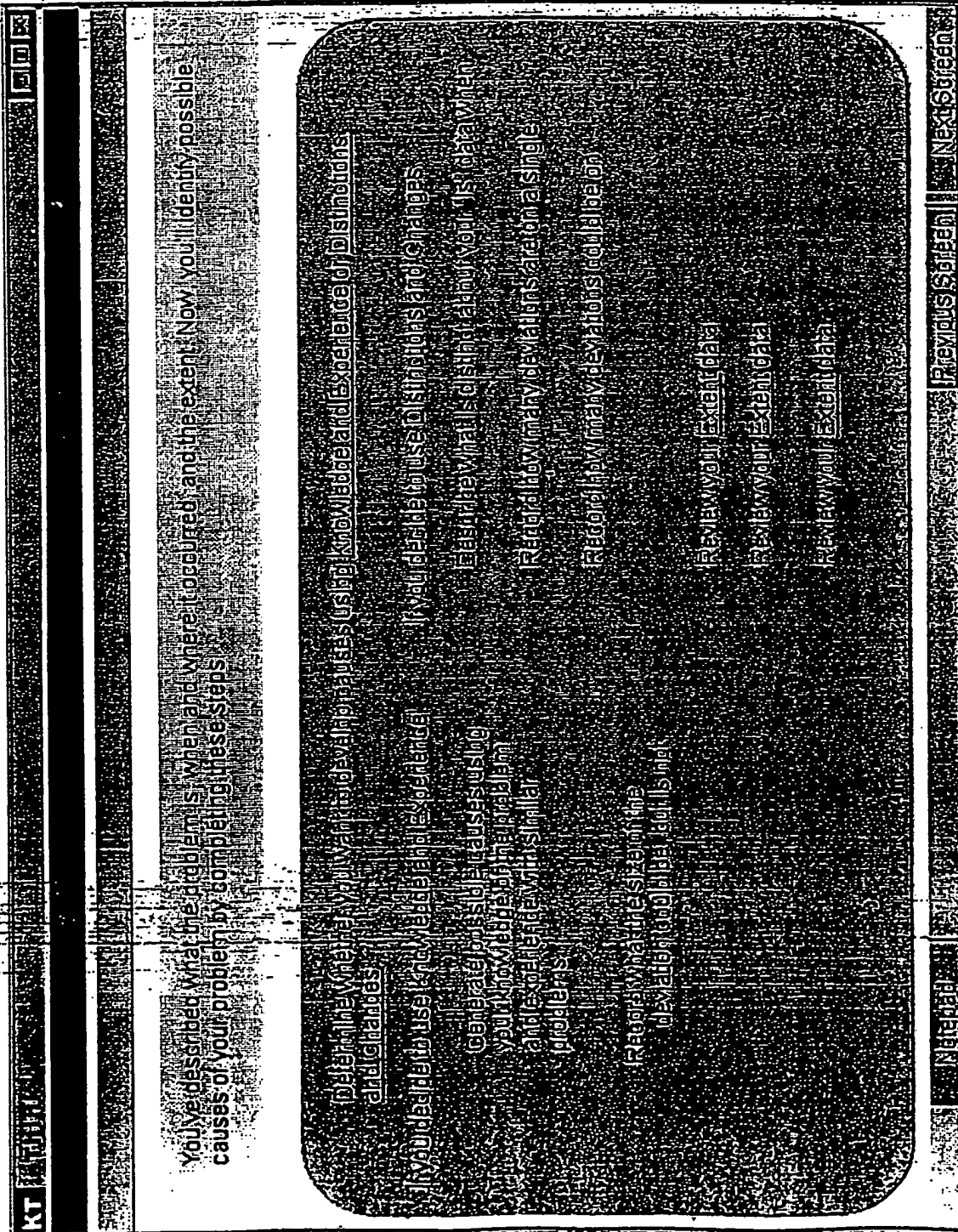


Fig. 121



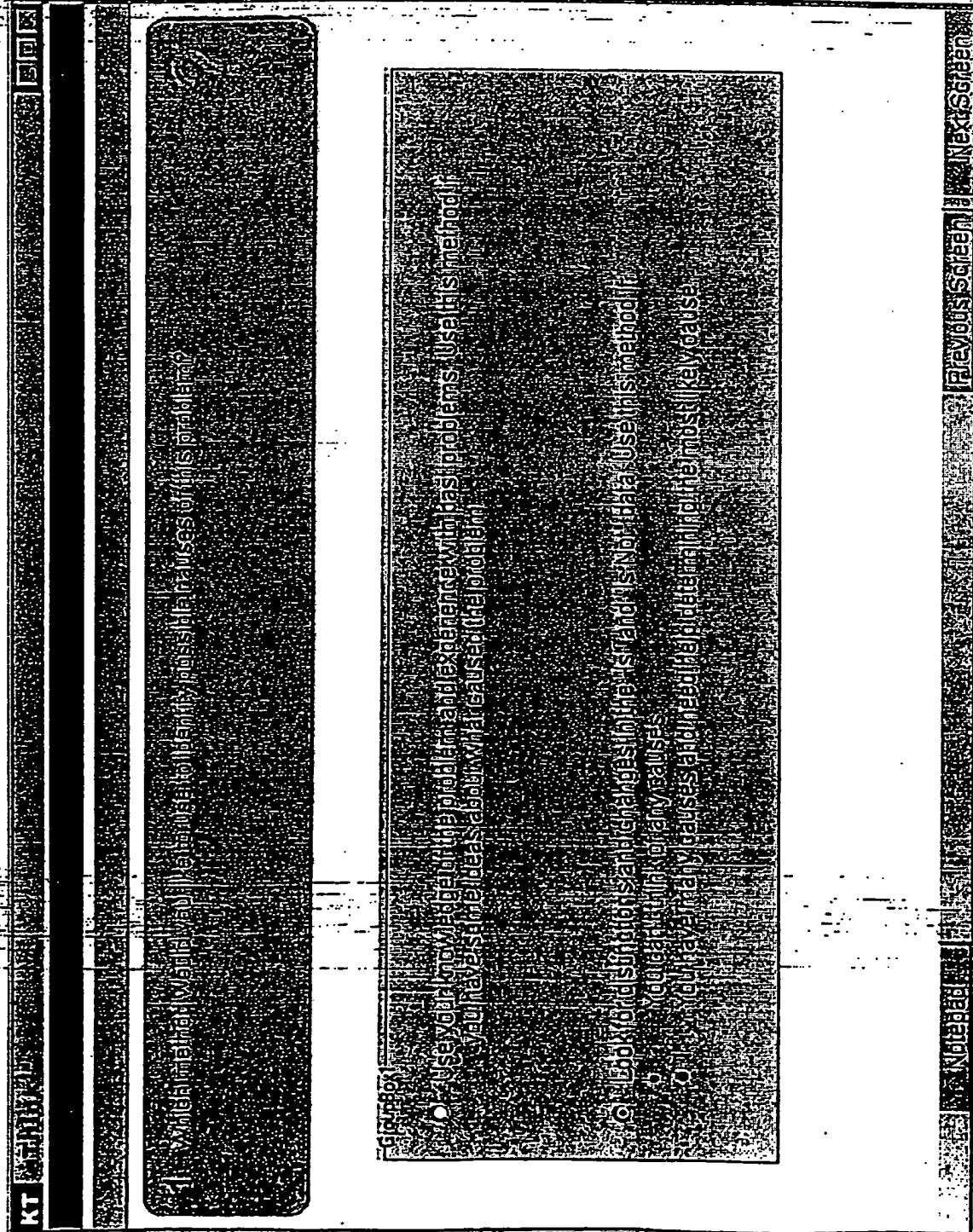


Fig. 122



KT			
<p>3a What has changed in only a word or about a word? Record each change and the date it occurred.</p>			
Is	Is Not	Distinctions	Changes
What deviation?			
Insert New (S) or Not Fair		Insert New Distinction	Insert New Change
<p>3b Look for changes in a word and distinction.</p>			
<p>Noted</p>			
<p>Playouts Screen</p>			
<p>Next Slide</p>			

Fig. 124

[illegible]

**Fig. 125**

<p><b>KT</b> </p>	
<p><b>6a) Have your distinction and change in condition have caused? Review your condition of changes and find all possible causes you initially.</b></p>	
<p><b>Distinctions</b></p>	<p><b>Changes</b></p>
<p></p>	<p></p>
<p><b>Possible Causes</b></p>	
<p></p>	
<p><b>Insert New Cause</b></p>	
<p><b>6b) (You think you've identified the main cause of the problem, click here for responsible causes)</b></p>	
<p><b>OTHER WEB CLIK NEXUS TECH</b></p>	
<p><b>Next Step</b></p>	<p><b>Previous Screen</b></p>
<p><b>Next Screen</b></p>	

Fig. 126

6a) How well do the symptoms in combination have caused the problem? Every combination of changes for each combination. Record all the possible causes you can think of.

Changes

Possible Causes

Insert New Cause

6b) How well have you identified the true cause of the problem. click here to test possible causes

otherwise click Next Screen

**Fig. 127**

Possible Causes	
7a) How could <b>you</b> use a <b>Red</b> flag? All the possible causes you can think of.	
<b>Insert New Possible Cause</b>	
7b) Look for causes in and out of the notice.	
How could <b>you</b> (a) <b>Red</b> flag? All the possible causes you can think of. How could <b>you</b> (b) <b>Red</b> flag? All the possible causes you can think of.	

**Fig. 128**

Is	Is Not	Distinctions	Changes	Possible Causes

**Review your Problem's Distinction:** Does your knowledge of this include all the your experience? What could have caused it? Is it or is not all the reasons listed causes you think it had?

**Insert New Distinction**      **Insert New Change**      **Insert New Possible Cause**

**Reset New/Find Pair**      **Next Screen**

**Fig. 129**



KT

2. Review your possible causes. Can you think of any other causes? If so, add them now. Are there any causes that you don't want to consider? If so, delete them now. Has anything

	Is	Is Not	
What object?			
What deviation?			
Where geographically?			
Where on the object?			
When first?			
When since?			
What pattern?			

Possible Causes

Insert New Possible Cause

Insert New/Is Not Pair

Previous Screen

Next Screen

Fig. 130

RT

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How well your situation and change in combination have caused a review every combination of changes and internal possible causes you can think of.

	Is	Is Not	
What object?			
What deviation?			
Where geographically?			
Where on the object?			
When first?			
When since?			
What pattern?			

Possible Causes

Is Not New Possible Cause

Is Disbanded Possible Cause

Is Not New Possible Cause

Is Disbanded Possible Cause

Previous Screen

Next Screen

Fig. 131

KT	Problem	Next Step
<p>You described what the problem had been. Now you'll describe the extent of the problem by completing these steps:</p>		
1	Trace possible causes against the Problem Statement and record any notes or assumptions.	
2	Review your assumptions.	
3	Identify the most probable cause.	
Notes	Previous Screen	Next Screen

Fig. 132

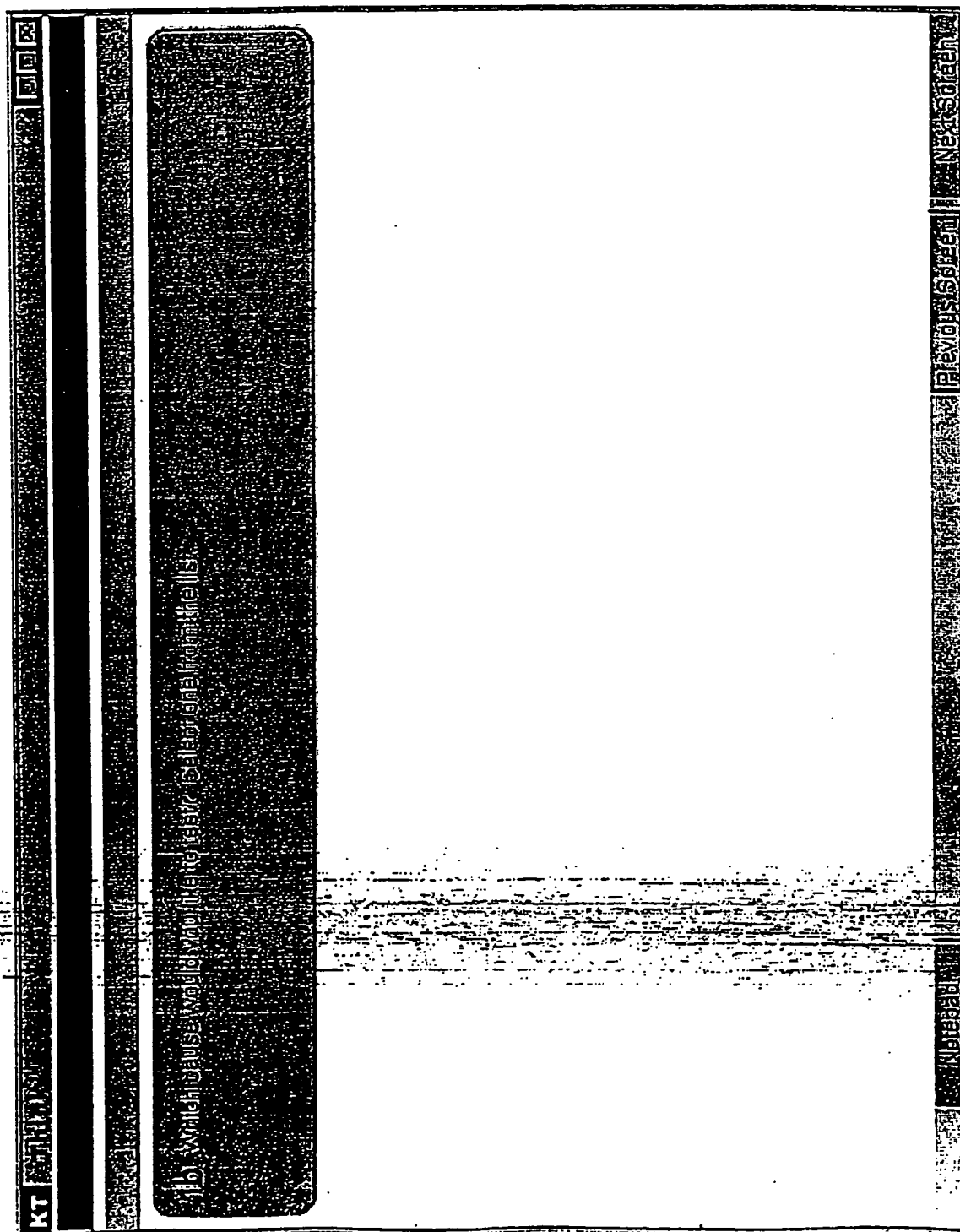


Fig. 133

KT		Previous Screen		Next Screen	
<p>If the true cause of loss is skeletal abnormality</p>					
<p>Explanations</p>		<p>Insert New Explanation</p>			
<p>Conditions</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Yes (true cause)</li> <li><input type="checkbox"/> No (not true cause)</li> <li><input type="checkbox"/> True (true cause)</li> </ul>		<p>Test the cause again. If the result is not fair</p>			
<p>Selection of cause of loss</p>		<p>Selection of cause of loss</p>			

Fig. 134

<p>Review your assumptions. Are there any other assumptions that you should include? If so, include them.</p> <p>In addition, review your explanations for "A" and "B" to make sure they are adequate.</p>	
Possible Causes	Explanations
<p>Insert New Explanation</p> <p>Previous Screen</p>	

Fig. 135

**3) What identifiable causes best explain the data in your problem statement? Select the one you think is the most probable cause of the problem.**

Most Probable Cause	Possible Causes	Explanations
C		
C		
C		
C		

**Fig. 136**

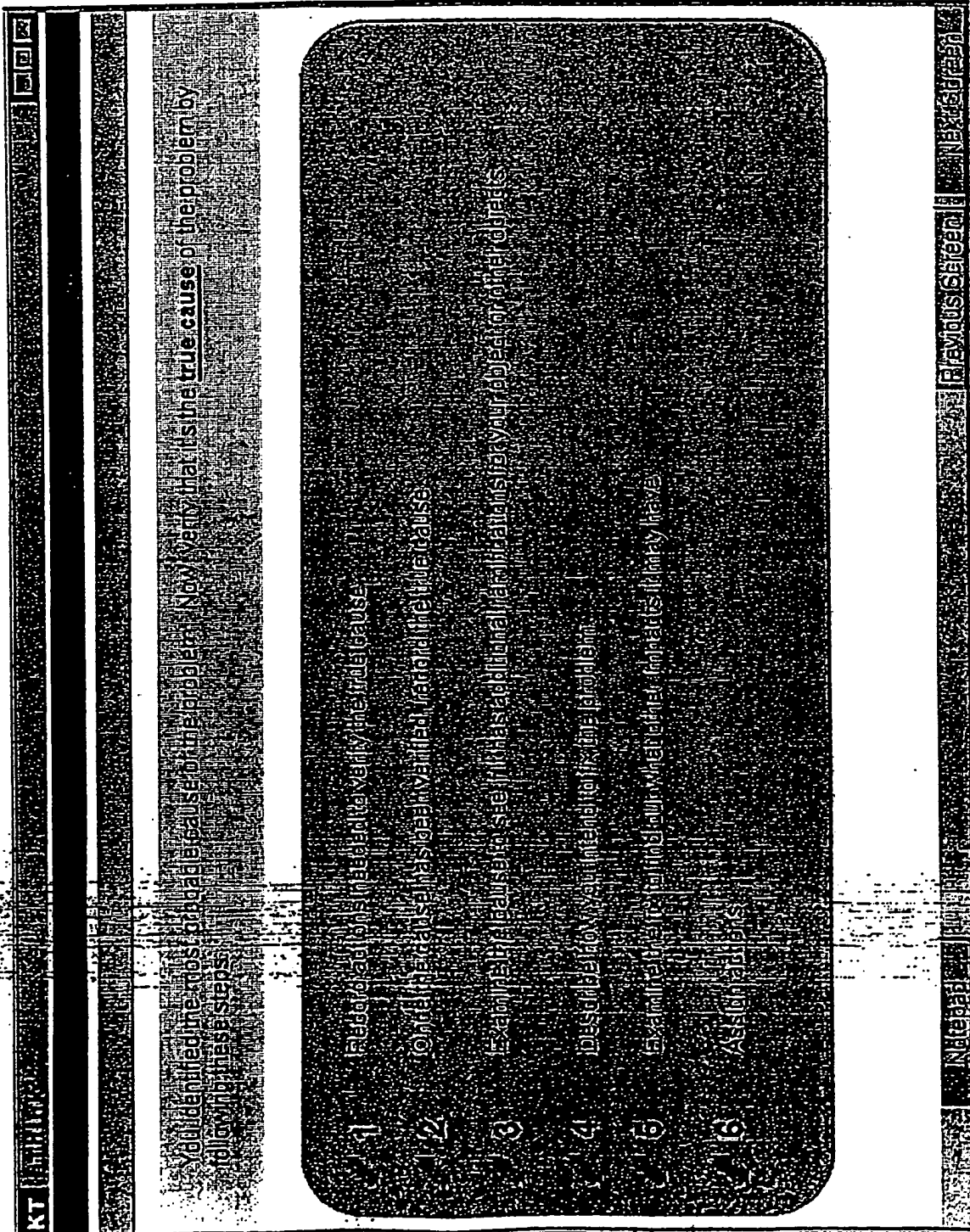


Fig. 137



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/15049

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G06F 15/20, 15/22, 7/00, 17/60, 19/00, 17/30

US CL : 705/1, 7, 8, 10

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/1, 7, 8, 10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

gathering, processing, storing, displaying, situations, problems, business, company, complex, complicated, hard

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,237,497 A (SITARSKI) 17 August 1993, col. 3, lines 35-52 col. 4, lines 19-54.	1-3
Y	US 5,331,545 A (YAJIMA et al) 19 July 1994, figures 1-4.	1-3
A,E	US 5,937,389 A (MAXWELL) 10 August 1999, col. 4, lines 10-67	1-3
A	US 5,737,727 A (LEHMANN et al) 07 April 1998, col. 7-67	1-3
A	US 5,675,745 A (OKU et al) 07 October 1997, col. 4, lines 3-65	1-3
A	US 5,521,814 A (TERAN et al) 28 March 1996, col. 4, lines 8-65.	1-3

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*E* earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A* document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 12 AUGUST 1999	Date of mailing of the international search report 20 OCT 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer TODD VOELT <i>James R. Matthews</i> Telephone No. (703) 305-2200

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/15049

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,321,605 A (CHAPMAN et al) 14 June 1994, col. 2, lines 49-68.	1-3